Candidates, Character, and Corruption*

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Abstract

We study the characteristics of self-selected candidates in corrupt political systems. Potential candidates differ along two dimensions of unobservable character: public spirit (altruism toward others) and honesty (the disutility suffered when selling out to special interests after securing office). Both aspects combine to determine an individual's quality as governor. We characterize properties of equilibrium candidate pools for arbitrary costs of running for office, including the case where those costs become vanishingly small. We explore how various policy instruments — the governor's compensation, anti-corruption enforcement, and term limits — affect the expected quality of governance through candidate self-selection. We also show that self-selection can have surprising implications for the effect of information disclosures concerning candidates' backgrounds.

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"Ninety-eight percent of the adults in this country are decent, hardworking, honest Americans. It's the other lousy two percent that get all the publicity. But then, we elected them." — Lily Tomlin

1 Introduction

According to one long-standing and widespread view, representative democracies suffer from a pernicious adverse selection problem: the citizens who are best suited to govern are least likely to seek office. Drawing on the citizen-candidate models of representative democracy due to Besley and Coate (1997) and Osborne and Slivinski (1996), a recent and growing literature has examined the nature of candidate self-selection with respect to ability or competence.[1] Yet concerns over adverse self-selection extend beyond candidates' abilities, to questions of character. As the political scientist V.O. Key quipped, "If the people can only choose among rascals, they are certain to choose a rascal."(Key, 1966) Some commentators attribute the purported prevalence of rascals among politicians to special interest groups, suggesting that they sully the political process and attract those of low character while discouraging those with conscience.

It is not obvious, however, that one should expect negative rather than positive candidate self-selection along all pertinent dimensions of character. On the one hand, office-holding provides opportunities for personal rent-seeking at the expense of the public good, which are presumably more attractive to selfish than public-spirited citizens. But on the one hand, the opportunities to promote the greater good that accompany office-holding are presumably more attractive to public-spirited citizens than to selfish ones.

The literature on candidate self-selection has largely ignored questions of character.[2] In this paper, we study candidate self-selection with respect to two dimensions of character: *public spirit* (defined as altruism toward other citizens) and *honesty* (defined as susceptibility to corruption). In our model, citizens who run for office may hope to benefit from both legitimate compensation (salary and ego-rents) and illicit compensation (contributions or bribes from interest groups). They bear campaign costs and, if elected, effort costs associated

[1] See, e.g., Caselli and Morelli (2004), Messner and Polborn (2004), Dal Bó et al. (2006), Poutvaara and Takalo (2007), and Mattozzi and Merlo (2008, 2010).

[2] Two exceptions are Caselli and Morelli (2001) (the working paper version of Caselli and Morelli (2004)), and Besley (2004), both of which focus on a characteristic that can be interpreted as honesty. Below, we clarify the relationships between those papers and the current analysis.

with producing public goods. Each citizen also recognizes that, if elected, his character will impact the quality of governance and hence general welfare. Character affects the tradeoffs between these costs and benefits. However, a candidate's character is not observed by the electorate (at least not initially). Thus, having a better character than one's opponents does not guarantee election.

A central feature of our model is that, as a consequence of the competing considerations noted in the previous paragraph, the incentive to run for office is a U-shaped function of public spirit. Moreover, dishonest citizens extract greater rents from holding office because of special interest politics. As a result, the citizens with the greatest incentive to run for office are those who are maximally dishonest, and either maximally or minimally public-spirited. This property has important implications for candidate self-selection.

We find that for any given number of candidates, the set of equilibrium candidate pools (when non-empty) is typically characterized by non-trivial lower and upper bounds on the expected quality of governance.[3] Candidates tend to be of mediocre quality: neither too good, because opponents would then drop out, nor too bad, because others would then enter. It is worth highlighting that the upper bound obtains without assuming a positive correlation between a citizen's quality and his outside market option; rather, in our model, all individuals have the same outside option.

The bounds on average candidate quality produce a negative correlation between public-spiritedness and honesty among candidates, even when those characteristics are uncorrelated in the population. Equilibria may be either symmetric (with candidates of identical or similar quality) or asymmetric (with candidates of sharply different quality), but in some cases all equilibria with a given number of candidates are asymmetric. The asymmetry is a direct consequence of the U-shaped entry incentives noted earlier. Thus, the model generates endogenous *volatility* in the quality of governance.

We investigate the effects of changes in two public policy instruments: the governor's compensation and the level of anti-corruption enforcement. The effects of these policies on the costs and benefits of holding office depend on a candidate's character; hence, beyond any incentive effects once in office, the policies alter the composition of the self-selected candidate pool. As the set of equilibria for a given number of candidates tends to be large (when it is non-empty), we focus on the comparative statics for the best and worst equilibria. For

[3] The number of candidates will be endogenously determined, but one must first understand the properties of candidate pools taking this number as given.

equilibria with a given number of candidates, the expected quality of governance in the best equilibria rises with the level of the governor's compensation, but does not improve, and may even decline, with the level of anti-corruption enforcement. Subject to some qualifications, the quality of governance in the worst equilibria typically improves when the governor's compensation rises, but declines when anti-corruption enforcement becomes more vigorous. Thus, if one ignores possible changes in the number of candidates, higher compensation tends to promote good governance, while anti-corruption enforcement is surprisingly counterproductive (and at best ineffective). The latter result holds even though enforcement reduces the degree to which any given governor would make concessions to special interests; it turns out that perverse selection effects overwhelm the beneficial pure incentive effects.

Compensation and anti-corruption policies may also affect the existence of equilibria for any given number of candidates, thereby forcing that number to change. With respect to the quality of governance, selection effects flowing through the number of candidates tend to work in the opposite direction from the effects discussed in the previous paragraph. Thus, the overall effects of the governor's compensation and anti-corruption enforcement on the quality of governance are surprisingly complex.

Fortunately, it is possible to evaluate the overall effects of the policy interventions — flowing through changes in the number of candidates, the composition of the candidate pool for a given number of candidates, and the behavior of a given candidate once in office — when the costs of running for office are vanishingly small (a common assumption in the "citizen-candidate" literature). Multiple-candidate equilibria converge to an essentially unique limiting equilibrium, which we characterize. This equilibrium consists of citizens with the greatest incentives to run for office. Typically, there is a bimodal distribution of character: all of the candidates are maximally dishonest, but, due to the U-shaped entry incentives noted above, there is a mixture of those with maximal and minimal public spirit. In other words, with small costs of running for office, typically *only highly asymmetric equilibria survive*; the model then has the strong implication that there is no variability in the predictable (dis)honesty of politicians, but substantial variability in the quality of governance through volatility in the public-spiritedness of the electoral victor.

For the limiting multiple-candidate equilibrium, we show that an increase in anti-corruption enforcement unambiguously improves the quality of governance. While this finding is consistent with simple intuition, the mechanism is surprising: for a wide range of parameter values, anti-corruption enforcement is on balance beneficial only because it reduces the number of candidates in equilibrium, thereby *indirectly* improving selection. In contrast, an increase in the governor's compensation has *no overall effect*, either beneficial or adverse; in other words, salary is surprisingly irrelevant.

As an extension of the model, we allow for the possibility that candidates may have different track records and/or reputations. As long as this information is not conclusive (formally, the conditional distribution of character types has full support no matter what information is observed), a change in the information structure has no effect on the set of equilibrium outcomes. This neutrality result has surprising implications for public policy. First, policies requiring the disclosure of background information concerning political candidates (e.g., criminal records) may have no effect on the character of elected officials or the quality of governance. Positive effects of information disclosures on voters' choices, documented for example by Banerjee et al. (2010, 2011), can be neutralized by self-selection effects once such disclosures are institutionalized. Second, the result casts doubt on the notion that elections for lower office in decentralized democracies — which provide opportunities for establishing track records and reputations — improve electoral outcomes for higher office by filtering the set of candidates (cf. Cooter, 2003; Myerson, 2006).

We also study the effects of incumbency and term limits by extending the model to a multi-period setting. Assuming character is at least partially revealed during a governor's first term, reelection opportunities can raise the quality of governance through two channels. The first is mechanical: the electorate gains the opportunity to reelect desirable incumbents. The second operates through selection effects: the benefits of running for office in the first place rise for high-quality candidates (for whom the odds of re-election are high) relative to low-quality candidates (for whom the odds are low). We show that a two-term limit unambiguously improves the quality of governance in *non*-incumbent elections compared to a one-term limit, due to self-selection effects arising from the possibility of re-election. In such settings, re-election patterns can corroborate the adage that voters prefer a known crook to an unknown crook. We also show that a two-term limit can have *adverse* self-selection effects compared to a one-term limit if experience in office sufficiently enhances the ability to extract rents from special interests.

As noted above, we are not the first to study self-selection with respect to any aspect of candidate character (as opposed to competence). Caselli and Morelli (2001), which is the working paper version of Caselli and Morelli (2004), and Besley (2004) consider models in which citizens choose to run for office based on a characteristic which one can interpret as honesty.[4] Neither of these papers studies selection with respect to public-spiritedness, which is central to our analysis. Both show that higher compensation improves the quality of the candidate pool, but neither explicitly models special-interest influence activities or studies anti-corruption enforcement. Their analyses of self-selection with respect to honesty also involve very different mechanisms than the one examined here,[5] and these differences account for our contrasting conclusions concerning the effects of compensation.[6]

In studying the effects of special-interest influence activities on candidate self-selection, our work is also related to Dal Bó et al. (2006) and Besley and Coate (2001). However, Dal Bó et al. (2006) focus on candidates' ability rather than character, while Besley and Coate (2001) analyze candidates' policy preferences. Moreover, Dal Bó et al. (2006) are primarily concerned with the interest groups' choice between violence and bribes (see also Dal Bó and Di Tella (2003)).

Finally, our analysis of incumbency is related to Smart and Sturm (2006), who study the impact of term limits in a setting where politicians can signal public spiritedness through their actions in office. In their setting, term limits can be beneficial because they reduce the incentives for selfish politicians to mimic public-spirited ones (in order to win reelection), thus providing the electorate with greater ability to identify an incumbent's type. We abstract from that mechanism in order to highlight self-selection effects, which are absent in Smart and Sturm (2006).

The next section lays out the basic model. Section 3 develops some preliminary analysis, showing why the incentive to run for office is a U-shaped of public spirit. We then characterize the outcomes of the one-period and multi-period games in Section 4 and Section 5, respectively. Section 6 concludes. Appendix A summarizes some of the notation used in the analysis; Appendix B provides proofs for all formal results; and a Supplementary

[4]In Caselli and Morelli (2001), candidates differ in a binary propensity to extract rents from a randomly encountered citizen; in Besley (2004), they are either "congruent" or "dissonant" with the electorate.

[5]Caselli and Morelli assume that a candidate's honesty is observable; dishonest candidates successfully run for office when the supply of honest candidates is insufficient to fill all available positions. Because the quality of governance is assumed to reflect the combined decisions of a continuum of office holders, honest candidates are not motivated by the desire to displace dishonest office holders, as they are in our model. Besley's assumptions concerning candidates' payoffs likewise remove any incentive to displace dissonant office holders. Furthermore, he assumes that the costs of running for office are zero, rather than vanishingly small. As a result, the pool of candidates does not consist of the citizens with the greatest incentives to run for office, as it does in our model.

[6]For example, in Besley's model, if the costs of running for office were vanishingly small rather than zero, all candidates would be dissonants with poor private-sector prospects, and as in our framework, compensation would have no impact on the quality of candidate pool.

Appendix available at the authors' webpages contains additional material.

2 The Model

We consider a society consisting of a continuum of citizens. Each citizen consumes two goods, a public good x and a private good r. For convenience, each citizen's endowment of the private good is normalized to zero. Citizens differ with respect to two preference parameters: an altruism or public spirit parameter $a \in [0, 1]$, and an honesty parameter $h \in [0, 1]$. The public spirit parameter, a, measures the degree to which a citizen cares about the well-being of other citizens. The honesty parameter, h, will come into play only if a citizen holds office; it determines the size of a utility penalty the individual suffers if he accepts payments from special interests. The magnitude of h could reflect susceptibility to pangs of conscience, aversion to social stigma or penalties, or skill at evading detection. We will refer to the pair (a, h) as a citizen's *character*.

Citizens who choose to run for office incur a personal campaign cost, $k > 0$. Although we are interested in arbitrary k, large or small, some of our results are for the limit as k becomes vanishingly small, a case that is prominent in the citizen-candidate literature. The purpose of considering k vanishingly small rather than zero is to assure that the expected number of candidates is finite and the probability of winning for any candidate is non-zero.

Governance. One citizen eventually becomes governor through a process explained below. The governor receives compensation s, which includes a salary and any ego benefits/costs from holding office. He exerts effort $e \geq 0$ to produce $f(e) \geq 0$ units of the public good at a personal cost $c(e)$, where both $f(\cdot)$ and $c(\cdot)$ are twice-differentiable functions.[7] Effort has positive but declining marginal returns ($f' > 0 > f''$), as well as positive and increasing marginal costs ($c' > 0$ and $c'' > 0$). For the usual reasons, we also assume $f(0) = c(0) = 0$, $f'(0) > c'(0)$, and $\lim_{e \to \infty} c'(e) = \infty$. In addition to producing the public good, the governor must decide whether to undertake a special-interest project ($z = 1$ denotes yes, $z = 0$ denotes no) which provides highly concentrated benefits to a special-interest group as described further momentarily. If implemented, the project is funded by a per-capita lump-sum tax, $q > 0$, that is levied on all citizens, including the governor.

[7] For simplicity, the governor's effort is the only input for producing public goods.

Special Interests. There is one special interest group or lobby, denoted L, which receives a payoff $v \geq 0$ if the governor chooses $z = 1$, and zero if $z = 0$. Afer the governor is elected, v is drawn from a cumulative distribution $\Phi(v)$ with support $[0, \overline{v}]$ and density $\phi(v) > 0$ for $v \in [0, \overline{v}]$. L can attempt to influence the governor by negotiating a payment to him, $t \geq 0$, contingent on $z = 1$. Agreeing to a contingent payment triggers a utility penalty on the governor of $g(h, \sigma) \geq 0$. The penalty depends upon the governor's honesty, h, as well as a policy variable, $\sigma \in [0, \overline{\sigma}]$, which indicates the level of anti-corruption enforcement. We assume g is twice continuously differentiable with $g_h > 0$ and $g_\sigma > 0$, where subscripts denote partial derivatives.[8] Thus, higher levels of honesty and anti-corruption enforcement imply higher personal costs of selling out to special interests.

For simplicity, we assume that the contingent tranfer, t, is determined by generalized Nash bargaining between the governor and the lobby. Specifically, the governor extracts the fraction $\alpha > 0$ of any bilateral surplus from the project.[9] Implicitly, this assumption presupposes that prior to negotiating the contingent payment, the lobby learns not only the stakes (v) but also the governor's true character (a and h), perhaps from their interaction after the governor takes office. Complete information between the lobby and the governor simplifies the bargaining problem but is not critical; our analysis requires only that more honest governors receive smaller benefits from special interest interactions, which is a property that will hold in a wide range of settings.

Net Payoffs. We assume that a citizen i's preferences are represented by the (von Neumann-Morgenstern) utility function

$$U_i(\cdot) = u_i(\cdot) + a_i u_c(\cdot), \tag{1}$$

where u_i is i's utility from personal consumption of private and public goods, u_c is the utility from personal consumption of the average (non-candidate) citizen, and a_i is i's public spiritedness characteristic.[10] Our central results hold generally for altruistic preferences

[8] One can think of g_σ as reflecting the impact of anti-corruption enforcement on the likelihood of detection and penalization.

[9] Other models of lobbying yield similar results. In an earlier draft, we assumed that two lobby groups would compete via a menu auction (Bernheim and Whinston, 1986) to implement conflicting special-interest projects.

[10] Even though citizens are altruistic, the payoffs of candidates and the governor do not show up in a typical citizen's utility function, because those individuals are of measure zero. Likewise, we do not include the special interest group's payoff in any citizen's utility, because the interest group is assumed to have constituents of measure zero (and the governor himself is not a constituent).

belonging to this broad and widely-studied class (cf. fn. 18),[11] but to ease exposition we adopt a simple functional form for $u_i(\cdot)$. Specifically, letting $\overline{r}$ denote the level of private good consumption for non-candidate citizens, assume that for any individual i,

$$U_i(x, r_i, \overline{r}; a_i) = (x + r_i) + a_i(x + \overline{r}). \tag{2}$$

Notice that if i is a non-candidate citizen, then $r_i = \overline{r} = -zq$,[12] so

$$U_i(x, r_i, \overline{r}; a_i) = (1 + a_i)(x - zq),$$

whereas if i is a losing candidate, $r_i = -zq - k$ and $\overline{r} = -zq$, so

$$U_i(x, r_i, \overline{r}; a_i) = (1 + a_i)(x - zq) - k.$$

This formulation implicitly assumes that all candidates have identical outside options. Unlike ability, characteristics such as honesty and public spiritedness create both advantages and disadvantages in the private sector, and it is not obvious whether they render the outside option more or less attractive. Systematic variation in potential private sector compensation would, of course, skew the candidate pool toward types with inferior alternatives.

We will use the index G to denote the governor. If G does not accept payments from L (so that $z = 0$), his payoff takes the same form as that of a losing candidate, except that he receives compensation, s, and incurs the disutility of effort, $c(e)$, to produce the public good. If G accepts a payment $t \geq 0$ from L (so that $z = 1$), he also receives t and incurs a utility penalty $g(h^G, \sigma)$. Thus, for the governor (2) is equivalent to:

$$U_G(x, r_G, \overline{r}, e; a_G) = (1 + a_G)(x - zq) - k + s - c(e) + z\left(t - g(h^G, \sigma)\right). \tag{3}$$

Throughout, we maintain the following assumption:

Assumption 1. *The distribution of character* (a, h) *has full support on* $[0, 1] \times [0, 1]$.

Our results hold for any population distribution of character so long as this full-support

[11]The use of a simple weighted average of own- and other-utility has a long tradition in economics (see, e.g. Barro and Becker, 1989), and is now standard (see, e.g. Levine, 1998). Our results can be generalized to an even broader class of utility functions provided one imposes additional conditions on the derivatives of U_i with respect to u_c, u_i, and a_i.

[12]Recall that we normalized private good endowment to 0 and the project is funded by a per-capita tax of q.

condition is satisfied; in particular, we make no assumption about correlation or lack thereof between honesty and public spirit. Candidates of the four extreme types will play significant roles in our analysis: those with maximal public spirit and maximal honesty, $a = h = 1$ (*Saints*); those with minimal public spirit and minimal honesty, $a = h = 0$ (*Scoundrels*); those with maximal public spirit and minimal honesty (*Sell-Outs*); and those with minimal public spirit and maximal honesty (*Principled Egoists*).

Candidates and elections. We assume that only *political insiders* have the opportunity to run for office.[13] The distribution of insiders' characteristics is representative of the population and has full support on the character space, $[0, 1] \times [0, 1]$. The mass of insiders is negligable, so the election is determined by *political outsiders*, who share the objective of maximizing $x + \bar{r}$. It is natural to assume that outsiders know rather little about the character of any yet-to-be-elected insider; for the sake of simplicity we assume that they are completely uninformed in that regard. In keeping with the citizen-candidate approach, candidates cannot differentiate themselves by commiting to either effort or project choices before they take office, and cannot signal their character during the electoral process.[14] Because non-incumbent candidates appear identical to the electorate *ex ante*, we make the following stylized assumption concerning the electoral process:

Assumption 2. *Every non-incumbent candidate wins the election with equal probability.*[15]

The purpose of this assumption is simply to avoid building in an inherent advantage for candidates of one type or another before their characters are publicly known. The assumption is compatible with outsiders voting on the basis of some idiosyncratic or even publicly observable shock, such as candidates' personalities or other valence attributes, so long as the distribution of voters' idiosyncratic valuations is ex-ante identical across indistinguishable candidates. Obviously, in our benchmark one-period model (without incumbents), Assumption 2 turns the election into a simple lottery.

[13]We assume that no insider is a constituent of the special interest group.

[14]In a Downsian model, Kartik and McAfee (2007) study the policy consequences of an exogenous set of candidates trying to signal character through their platforms.

[15]Some care must be taken when the set of candidates is countably infinite, because one cannot define a uniform probability measure on a countably infinite space. What is important for our purposes, however, is the probability with which any insider believes he will win the election if he runs, taking as given the set of other candidates. We assume that this probability is zero when there is an infinite number of other candidates. The actual probability measure governing the winner's selection from the infinite number of candidates is inessential.

It is natural to assume that political insiders know more about each others' characteristics (through professional reputations, past dealings, and explicit inquiries) than does the general public. To keep the model tractable, we make the somewhat stark but directionally reasonable assumption that insiders can observe each others' characters perfectly. The one-period game then entails complete information.[16]

Sequence of Events. In each election cycle, events unfold as follows:

1. Insiders decide whether to run for office.
2. The governor is elected, and his character is observed by the lobby group and political outsiders. If there are no candidates, no governor is elected and the quality of governance is assumed to be very low (as detailed later).
3. The magnitude of lobbying stakes, $v \in [0, \overline{v}]$, is realized, and is observed by the governor and the interest group.
4. The lobby makes an offer to the governor, as determined by generalized Nash bargaining.
5. The governor chooses effort, $e \geq 0$, and a project implementation decision, $z \in \{0, 1\}$, along with any necessary taxes.

We study the subgame perfect Nash equilibria of this game.

3 The Governor's Choices

In this section, we solve for post-election behavior, including the governor's choices of whether to the implement special interest project and how much effort to expend toward producing the public good. For notational simplicity, in this section only we will use h and a without a G superscript to denote the characteristics of the governor.

[16] In multiple-period models, elections involving incumbents turn on voters' beliefs about the character of the incumbent and the challengers. Hence, such models cannot be treated as games of complete information unless one makes additional mechanical assumptions about incumbent elections; see Section 5.

3.1 Effort Choice

The governor's effort is determined solely by his public spirit, and does not depend on his honesty or the special-interest transfer.[17] The optimal effort level, $e^*(a)$, is given by the first order condition $(1+a) f'(e^*(a)) = c'(e^*(a))$. Since f is strictly concave and c is strictly convex, $e^*(\cdot)$ is strictly increasing. For every citizen j, let $e^j := e^*(a^j)$ and $x^j := f(e^j)$.

The contribution of the public good to the well-being of the governor is given by

$$\pi(a) := (1+a) f(e^*(a)) - c(e^*(a)). \tag{4}$$

By the envelope theorem, $\pi'(a) = f(e^*(a)) > 0$. Furthermore, $\pi''(a) = f'(e^*(a))\frac{de^*(a)}{da} > 0$, i.e. the governor's gain from providing the public good (measured as an equivalent variation in units of the private good) is a *convex function* of the public spirit parameter, a. This convexity property will prove important, so it is essential to recognize that it does not rely on the particular functional form for preferences specified in (2). The intuition is transparent: given preferences of the form (1), the envelope theorem implies that the derivative of the governor's utility with respect to his public spirit is just the utility of the average citizen evaluated using the governor's optimal choices, and under mild conditions the average citizen's utility is increasing in the governor's public spirit.[18]

3.2 The Lobbying Stage

Ignoring any transfer from the interest group, implementing the special-interest project imposes a cost on the governor of

$$v^*(a,h,\sigma) := (1+a)q + g(h,\sigma). \tag{5}$$

[17]This result follows from the assumed separability of utility. Our analysis only requires that the governor's effort is increasing in his public spirit, which would also be the case under less restrictive assumptions.

[18]More formally, suppose that any citizen i's personal utility can be written as $u^1(x, e_i) + u^2(r_i, z_i h_i)$ and his overall utility is given by (1). Note that here e_i and z_i refer respectively to the effort exerted by i and whether i has committed the dishonest act of accepting payments from special interests; both are necessarily 0 for any citizen who is not the governor. Suppose further that standard conditions justifying interior optima, the envelope theorem, and local comparative statics hold. Then, in lieu of (4), we would have $\pi(a) = u^1(f(e^*(a)), e^*(a)) + au^1(f(e^*(a)), 0)$. Differentiating and applying the envelope theorem yields $\pi'(a) = u^1(f(e^*(a)), 0)$, and differentiating again yields $\pi''(a) = u^1_x(f(e^*(a)), 0)f'(e^*(a))\frac{de^*(a)}{a}$, which is strictly positive as long as effort rises with public-spiritedness, as it must in any reasonable specification.

Nash bargaining implies that the project will be implemented if and only if it generates positive bilateral surplus for G and L combined, which requires $v - v^*(a,h,\sigma) > 0$.[19] G receives the fraction α of any positive surplus, so $t = \alpha v + (1-\alpha)v^*(a,h,\sigma)$.

Because $v^*(a,h,\sigma)$ is increasing in each argument, governors who are more public spirited and more honest are less likely to accept special interest payments, and the frequency with which any governor sells out declines with the level of anti-corruption enforcement. Thus, one might expect anti-corruption enforcement to improve the quality of governance; we will see, however, that matters are more complex.

Throughout, we impose the following assumption:

Assumption 3. $v^*(0,1,0) > \overline{v} > v^*(1,0,\overline{\sigma})$.[20]

According to the first inequality, a maximally honest governor never sells out even if he is minimally public spirited (i.e., a Principled Egoist) and anti-corruption policy is lax. According to the second inequality, even with maximal anti-corruption enforcement, a minimally honest but maximally public-spirited governor (i.e., a Sell-Out) always sells out if the stakes are sufficiently high. We note that no governor (including a Scoundrel) will sell out when v is sufficiently small, even under minimal anti-corruption policies.

The preceding discussion readily implies:

Lemma 1. *A governor's expected rents from special interest politics, evaluated prior to the realization of v, is $\mathbb{E}_v \max\{\alpha[v - v^*(a,h,\sigma)], 0\}$. The associated impact on the expected payoff of any other citizen with public spiritedness a' is $-(1+a')q\left[1 - \Phi\left(v^*(a,h,\sigma)\right)\right]$.*

(All proofs are in Appendix B.) Notice that the governor's expected rents from lobbying depend not only on his honesty, but also on his public-spiritedness. As a result, special interest politics distort self-selection incentives toward less public-spirited insiders (and not simply toward less honest ones), who have relatively more to gain from securing office in their presence. Moreover, anti-corruption enforcement will potentially affect the quality of governance through selection effects involving public-spiritedness as well as honesty. As we will see, that selection effect turns out to be important.

[19] We assume the project is not implemented when the surplus is zero; this is innocuous because the distribution of v has no atoms.

[20] Recall that $\overline{v}$ is the upper bound on v. Stated in terms of primitives, the assumption requires $g(1,0)+q > \overline{v} > g(0,\overline{\sigma}) + 2q$.

In what follows, it will be useful to understand how the governor's expected rents from lobbying vary with his public spiritedness. Differentiation yields

$$\begin{aligned} \frac{\partial}{\partial a}\mathbb{E}_v \max\{\alpha[v - v^*(a,h,\sigma)], 0\} &= \frac{\partial}{\partial a}\int_{v^*(a,h,\sigma)}^{\infty} \alpha\left[v - v^*(a,h,\sigma)\right]\phi(v)dv \\ &= -\alpha q(1-\Phi(v^*(a,h,\sigma))) \leq 0, \end{aligned} \tag{6}$$

and

$$\frac{\partial^2}{\partial a^2}\mathbb{E}_v \max\{\alpha[v - v^*(a,h,\sigma)], 0\} = \alpha q^2 \phi\left(v^*(a,h,\sigma)\right) \geq 0,$$

where both inequalities are strict when $\overline{v} > v^*(a,h,\sigma)$. Thus, a higher level of public spiritedness reduces the expected rents for a governor from special interests. Furthermore, the governor's expected payoff from lobbying, like his benefit from providing the public good, is a *convex function* of public spirit. This second convexity property will also prove important, so we emphasize that it too does not rely on the specific functional form of preferences specified in (2). The general intuition is as follows: when taking the derivative of the governor's expected rents from lobbying with respect to a, the effect of a on the set of lobbying stakes for which the governor sells out (i.e., on the limits of integration in (6)) can be ignored because the governor optimizes the scope of that set. Thus, as long as preferences take the general form shown in (1), that derivative will equal the expected utility loss the average citizen experiences because the governor sometimes bows to the lobby (scaled by the governor's bargaining weight). This derivative, which is negative, will be increasing in a as long as greater public spirit reduces the likelihood that the governor sells out.[21]

4 The One-Period Game

This section examines insiders' decisions to run for office when there is just one election with no incumbent. Given the continuation payoffs derived in Section 3, the problem reduces to a simultaneous-move entry game. We focus initially on pure strategy Nash equilibria of this game (assuming they exist). The analysis reveals the various equilibrium forces at work, both for a given set of parameters and as the parameters change. Equilibrium existence is assured in Subsection 4.4 by extending the analysis to randomized entry decisions, where we also study the prominent special case of vanishing entry costs. We remind readers that

[21] A formal argument can be given along the same lines as in fn. 18.

Appendix A provides a summary of some important notation.

Let $u^G(a, h \mid \sigma, s)$ be the expected payoff (evaluated prior to the realization of lobbying stakes, v) for a governor of type (a, h) ignoring entry cost k, and let $u(a, h \mid a', \sigma)$ be the expected payoff for a non-candidate of type a' when the governor's type is (a, h). From Section 3, we have

$$u^G(a, h \mid \sigma, s) = \pi(a) + \mathbb{E}_v \max\{\alpha[v - v^*(a, h, \sigma)], 0\} + s,$$

$$u(a, h \mid a', \sigma) = (1 + a')\, Y(a, h|\sigma),$$

where

$$Y(a, h|\sigma) := f(e^*(a)) - q(1 - \Phi(v^*(a, h, \sigma))).$$

We will refer to $Y(a, h|\sigma)$ as the *quality of governance* when the governor's characteristics are (a, h), and to $y^i(\sigma) := Y(a^i, h^i|\sigma)$ as the *quality of candidate* i. Note that quality depends on the levels of the public good and expected taxes. Anti-corruption enforcement, σ, has a direct effect on a candidate's quality (except when h is sufficiently high), but compensation, s, does not. Quality is bounded above by that of a Saint, $y^{\max} := f(e^*(1))$, and below by that of a Scoundrel, $y^{\min}(\sigma) := Y(0, 0|\sigma)$.[22]

In the (a, h)-plane, constant quality curves defined by the equation $Y(a, h \mid \sigma) = C$ (for some constant C) are generally downward sloping, because an increase in public spiritedness is required to offset a decrease in honesty.[23] An increase in σ (weakly) improves the quality of any given candidate, thereby inducing a leftward shift in every such curve.

We now turn to the incentive constraints that govern equilibrium. Denote the set of candidates as $\mathcal{N}$ and let $N := |\mathcal{N}|$. As we restrict attention for the moment to pure entry strategies, $\mathcal{N}$ completely describes an equilibrium and N is necessarily finite. The following

[22]Note that the quality of a Saint, $y^{\max}$, does not depend on anti-corruption enforcement, σ, because a Saint never succumbs to the interest group even under minimal anti-corruption enforcement.

[23]The "generally" caveat excludes cases where honesty is already so high that the candidate never sells out to the interest group.

two conditions are necessary and sufficient for $\mathcal{N}$ to constitute an equilibrium:

$$\forall i \in \mathcal{N}: \quad \frac{1}{N}\left[u^G\left(a^i, h^i \mid \sigma, s\right) - \mathbb{E}_{j\in\mathcal{N}\setminus i} u\left(a^j, h^j \mid a^i, \sigma\right)\right] \geq k, \tag{7}$$

$$\forall i \notin \mathcal{N}: \quad \frac{1}{N+1}\left[u^G\left(a^i, h^i \mid \sigma, s\right) - \mathbb{E}_{j\in\mathcal{N}} u\left(a^j, h^j \mid a^i, \sigma\right)\right] \leq k. \tag{8}$$

Inequality (7) requires that candidates prefer to enter the campaign rather than stay out,[24] whereas inequality (8) requires that non-candidates prefer to stay out rather than enter.

In an equilibrium with a set of candidates $\mathcal{N}$, the average quality of the candidates is $y^{\mathcal{N}}(\sigma) := \frac{1}{N}\sum_{j\in\mathcal{N}} y^j(\sigma)$. In the following sections, we will study the effects of the policy variables s and σ on the expected quality of governance, primarily by determining their effects on the highest and lowest expected quality achievable in any N-candidate equilibrium, denoted $\overline{y}_N(\sigma, s)$ and $\underline{y}_N(\sigma, s)$, respectively. Note that while σ can have both *incentive and selection effects* — it can affect the post-election behavior of the governor and also affect the composition of the candidate pool — s can matter only through selection effects.

To characterize equilibria, we need to know which types of non-candidate insiders have the greatest incentive to run for office when the quality of governance is y. The expression $u^G(a, h \mid \sigma, s) - (1+a)y$ captures the magnitude of that incentive.[25] It is straightforward that the governor's personal benefit from lobbying is weakly decreasing in h. Also, as was shown in Section 3, $\pi(a)$ and $\mathbb{E}_v \max\{\alpha[v - v^*(a, h, \sigma)], 0\}$ are both convex in a. Consequently, either Scoundrels or Sell-Outs (or both) have strictly greater incentives to run than all other insiders. Between Scoundrels and Sell-Outs, the type with the greatest incentive depends on y and σ, which differentially affect their gains from holding office. Low (resp. high) y provides relatively greater (resp. lesser) incentives for Sell-Outs due to their greater public spirit.

Formally, defining

$$\begin{aligned} y^*(\sigma) &:= u^G(1, 0|\sigma, s) - u^G(0, 0|\sigma, s) \\ &= \pi(1) - \pi(0) + \alpha\left(\mathbb{E}_v \max\{v - v^*(1, 0, \sigma), 0\} - \mathbb{E}_v \max\{v - v^*(0, 0, \sigma), 0\}\right), \end{aligned} \tag{9}$$

[24] If $\mathcal{N}$ is a singleton, then the left hand side of (7) is not well defined. We assume that this entry incentive constraint is always satisfied when $N = 1$ because the consequences of having no governor are sufficiently dire.

[25] For this purpose, we can ignore the probability of winning as well as the cost of running because those factors affect all potential candidates equally. An individual of type (a, h) has a strict incentive to enter if and only if $u^G(a, h \mid \sigma, s) - (1 + a)y > (N + 1)k$.

we have:

Lemma 2. *Given any set $\mathcal{N}$ of candidates, the set of non-candidate insider types with the greatest incentive to enter (i.e. that maximize $u^G(a, h \mid \sigma, s) - (1 + a)y^{\mathcal{N}}$) consists of Sell-Outs alone if and only if $y^{\mathcal{N}} < y^*(\sigma)$, Scoundrels alone if and only if $y^{\mathcal{N}} > y^*(\sigma)$, and both Sell-Outs and Scoundrels if and only if $y^{\mathcal{N}} = y^*(\sigma)$.*

It follows that (8) is satisfied for all (a^i, h^i) if and only if it is satisfied for Scoundrels ($a^i = h^i = 0$) and Sell-Outs ($a^i = 1$, $h^i = 0$). Accordingly, we can rewrite (8) as follows:

$$y^{\mathcal{N}} \geq y^{\ell}_N(\sigma, s) := \max\left\{\frac{u^G(1, 0 \mid \sigma, s) - (N + 1)k}{2}, u^G(0, 0 \mid \sigma, s) - (N + 1)k\right\}. \tag{10}$$

Thus, $y^{\ell}_N(\sigma, s)$ provides a lower bound on average quality in an equilibrium with N candidates.

A change in a policy variable (σ or s) can affect electoral outcomes either by altering the set of equilibria for a given number of candidates, or by inducing either more or fewer candidates to enter. To provide a better understanding of policy effects, we first examine these channels separately and then study their combined effects.

4.1 Single-Candidate Equilibria

We first consider equilibria in which only a single candidate, i, runs for office. In that case, (7) is automatically satisfied (recall fn. 24), while (10) becomes

$$y^i \geq y^{\ell}_1(\sigma, s) = \max\left\{\frac{u^G(1, 0 \mid \sigma, s) - 2k}{2}, u^G(0, 0 \mid \sigma, s) - 2k\right\}. \tag{11}$$

Thus, provided $y^{\max} \geq y^{\ell}_1(\sigma, s)$, for every insider i with $y^i \in \left[\min\left\{y^{\ell}_1(\sigma, s), y^{\min}(\sigma)\right\}, y^{\max}\right]$ there is an equilibrium in which i runs unopposed. In this case, $\underline{y}_1(\sigma, s) = \min\left\{y^{\ell}_1(\sigma, s), y^{\min}(\sigma)\right\}$ and $\overline{y}_1(\sigma, s) = y^{\max}$. As shown in Figure 1, when $y^{\ell}_1(\sigma, s) > y^{\min}(\sigma)$, the set of potential unopposed candidates corresponds to all insiders with characteristics in the lightly-shaded area above the constant quality curve $Y(a, h \mid \sigma) = y^{\ell}_1(\sigma, s)$.

Turning to policy analysis, neither s nor σ affects the quality of the best possible candidate, because $\overline{y}_1(\sigma, s) = y^{\max}$ so long as single-candidate equilibria exist. We therefore focus on the quality of the worst possible candidate, $\underline{y}_1(\sigma, s)$.

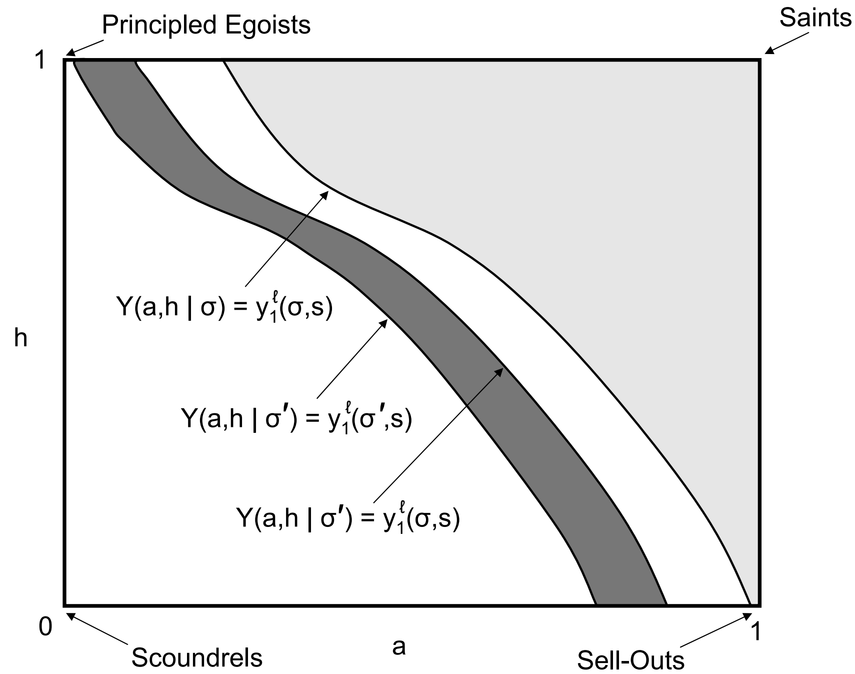

Figure 1: Single-Candidate Equilibria, and the Effect of Anti-Corruption Enforcement

Consider the effect of varying compensation, s. Trivially, $u^G(1,0 \mid \sigma, s)$ and $u^G(0,0 \mid \sigma, s)$ are strictly increasing in s; therefore, so is $y_1^\ell(\sigma,s)$. It follows that an increase in s strictly improves the quality of the worst possible candidate, $\underline{y}_1(\sigma,s)$, when $y_1^\ell(\sigma,s) \geq y^{\min}(\sigma)$; otherwise, it has no effect (because $y^{\min}(\sigma)$ is independent of s). In Figure 1, an increase in s shifts the constant quality curve that bounds the set of potential unopposed candidates to the north-east. Intuitively, when the rewards to office-holding are greater, each insider has more incentive to enter against a candidate of any given quality, so the lower bound on the quality of any unopposed candidate must rise. However, setting s too high would eliminate single-candidate equilibria.

Next consider the effect of varying anti-corruption enforcement, σ. It is easy to check that $u^G(1,0 \mid \sigma, s)$ and $u^G(0,0 \mid \sigma, s)$ are strictly decreasing in σ; therefore, so is $y_1^\ell(\sigma,s)$. It follows that if $y_1^\ell(\sigma,s) > y^{\min}(\sigma)$, so that very low quality candidates cannot run unopposed, an increase in anti-corruption enforcement reduces $\underline{y}_1(\sigma,s)$, worsening the least attractive equilibrium. This result is somewhat counterintuitive: after all, the policy has a positive incentive effect of reducing the frequency with which any elected citizen would sell out. However, there is a detrimental selection effect: because the policy reduces the rents to holding office, each insider has less incentive to enter against a candidate of a given quality

y; thus, single candidates of lower quality go unchallenged.

Figure 1 illustrates these effects. The curve labeled $Y(a,h \mid \sigma) = y_1^{\ell}(\sigma,s)$ identifies the lowest quality candidates who can run unopposed with policy (σ,s). When σ increases to σ', the incentive effect causes the quality of any given candidate to rise, hence the constant quality curve for the original level of candidate quality shifts left to $Y(a,h \mid \sigma') = y_1^{\ell}(\sigma,s)$. However, there is also a selection effect: in the figure, the boundary that defines the set of potential unopposed candidates shifts leftward from $Y(a,h \mid \sigma) = y_1^{\ell}(\sigma,s)$ to $Y(a,h \mid \sigma') = y_1^{\ell}(\sigma',s) < y_1^{\ell}(\sigma,s)$. The quality of governance in an equilibrium under policy σ' with a single candidate whose characteristics lie in the darkly-shaded area is lower than for *any* single-candidate equilibrium with enforcement level $\sigma < \sigma'$.

If, contrary to what we assumed in the last two paragraphs, $y_1^{\ell}(\sigma,s) < y^{\min}(\sigma)$, then any candidate can run unopposed. An increase in anti-corruption enforcement is then potentially beneficial because there are no selection effect, and it raises $\underline{y}_1(\sigma,s) = y^{\min}(\sigma)$.

Note finally that sufficiently lax anti-corruption enforcement may eliminate all single-candidate equilibria, just like sufficiently high compensation. We return to this point shortly.

4.2 Multiple-Candidate Equilibria

Next we consider equilibria with more than one candidate. The analysis of the incentive constraint for non-candidate insiders, expression (10), is very similar to the case of single-candidate equilibria. Turning to the incentive constraint for candidates, we can rewrite (7) as

$$u^G(a,h \mid \sigma,s) - (1+a)y \geq Nk, \tag{12}$$

where y is the average quality of the other $(N-1)$ candidates. Since $u^G(a,h \mid \sigma,s)$ is decreasing in h, if (12) is satisfied for some (a,h), it is also satisfied for (a,h') with $h' < h$. Thus, defining $I(a,h \mid y,\sigma,s) := u^G(a,h \mid \sigma,s) - (1+a)y$, the equation $I(a,h \mid y,\sigma,s) = Nk$ defines the boundary between candidates who are willing and not willing to run for office, given $N-1$ opponents of average quality y.

Next we determine the shape of the aforementioned boundary. Applying the implicit function theorem to calculate $\frac{dh}{da}$ along the boundary for a point on its interior yields

$$\left.\frac{dh}{da}\right|_{I(a,h|y,\sigma,s)=Nk} = \frac{f(e^*(a)) - q(1-\Phi\left[v^*(a,h,\sigma)\right]) - y}{g_h(h,\sigma)(1-\Phi\left[v^*(a,h,\sigma)\right])}. \tag{13}$$

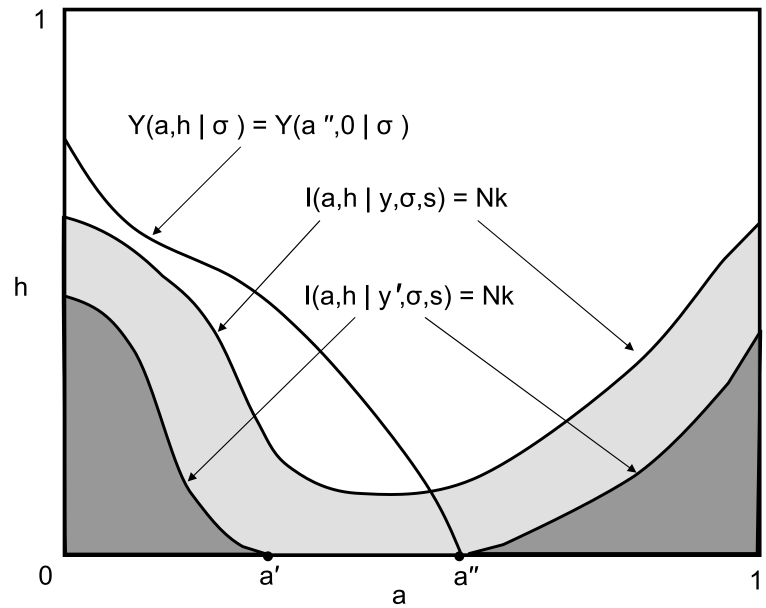

Figure 2: Willing Candidates

Since $g_h(h, \sigma) > 0$, the sign of (13) is the same as that of the numerator. As the numerator is increasing in both a and h, it follows that if the boundary is upward sloping in a at (a, h), it is upward sloping at all points $(a', h') \geq (a, h)$.[26] Thus, for any given y, the willing-candidate boundary in (a, h)-space is single-troughed. Figure 2 depicts the boundary defined by $I(a, h \mid y, \sigma, s) = Nk$, along with the set of willing candidates (lightly shaded).

To identify equilibria, we translate the problem into quality space by defining a correspondence $\Psi_N(\cdot)$ that maps the average quality of $N-1$ opponents into the quality levels of all candidates who are willing to run:

$$\Psi_N(y \mid \sigma, s) = \{y' \mid \exists (a, h) \in [0,1]^2 \text{ with } Y(a, h \mid \sigma) = y' \text{ and } I(a, h \mid y, \sigma, s) \geq Nk\}.$$

It is immediate from (12) that if $y_1 > y_2$, then $\Psi_N(y_1 \mid \sigma, s) \subseteq \Psi_N(y_2 \mid \sigma, s)$ (i.e., if the quality of opponents improves, the set of willing candidates shrinks). It follows that $\max \Psi_N(y \mid \sigma, s)$ is weakly decreasing in y.

If the set of willing candidates given $N-1$ opponents of expected quality y (i.e. $\{a, h \in [0,1]^2 \mid I(a, h \mid y, \sigma, s) \geq Nk\}$) is path-connected (as it is in Figure 2), then $\Psi_N(y \mid \sigma, s)$

[26] Here, $\geq$ is in the usual component-wise vector order.

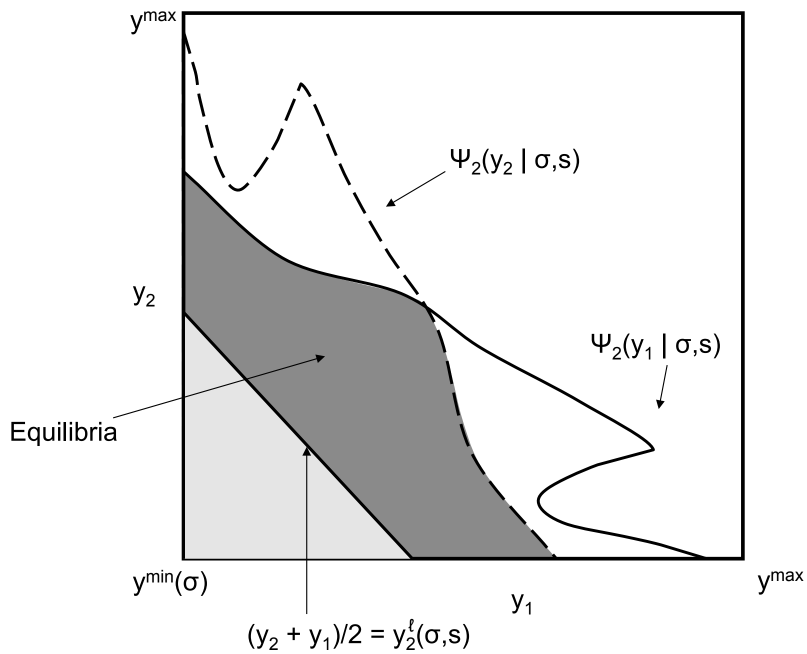

Figure 3: The Willing-Quality Correspondence and Two-Candidate Equilibria

is a convex set.[27] However, the set of willing candidates need not be path-connected for all levels of opponents' quality. An inspection of (12) reveals that when opponents' quality increases, the willing-candidate boundary shifts downward, and more so at higher values of a (i.e., for individuals who attach greater weight to quality). Consequently, for $y' > y$, the willing-candidate boundary can intersect the a-axis twice (as does the boundary defined by $I(a, h \mid y', \sigma, s) = Nk$ in Figure 2), in which case the set of willing candidates (dark shading in Figure 2) is not path-connected, and $\Psi_N(y' \mid \sigma, s)$ may not be convex.[28]

Figure 3 illustrates quality-of-willing-candidate correspondences with two candidates, $\Psi_2(y \mid \sigma, s)$ (for candidate 1, $\Psi_2(y_2 \mid \sigma, s)$ is bounded by the dashed curve, and for candidate 2, $\Psi_2(y_1 \mid \sigma, s)$ is bounded by the solid curve, where y_k denotes the quality of candidate k). We have drawn it as convex-valued for low values of y, but not for moderate values, reflecting the possibilities shown in Figure 2. We have also drawn it as empty for high values of y to illustrate the possibility that there may be no willing candidates in such cases.

Figure 3 also illustrates how to identify two-candidate equilibria. Plainly, both candi-

[27]This statement follows from the continuity of $Y(\cdot, \cdot|\sigma)$.

[28]We say "may not be" because $\Psi_N(y' \mid \sigma, s)$ could be convex even if the set of willing candidates is not path-connected. The necessary and sufficient condition for non-convexity of $\Psi_N(y' \mid \sigma, s)$ is that there are two solutions to $I(a, 0 \mid y', \sigma, s) = Nk$, a' and $a'' > a'$, such that the constant quality curve passing through $(a'', 0)$ does not touch the willing-candidate boundary elsewhere, as shown in Figure 2.

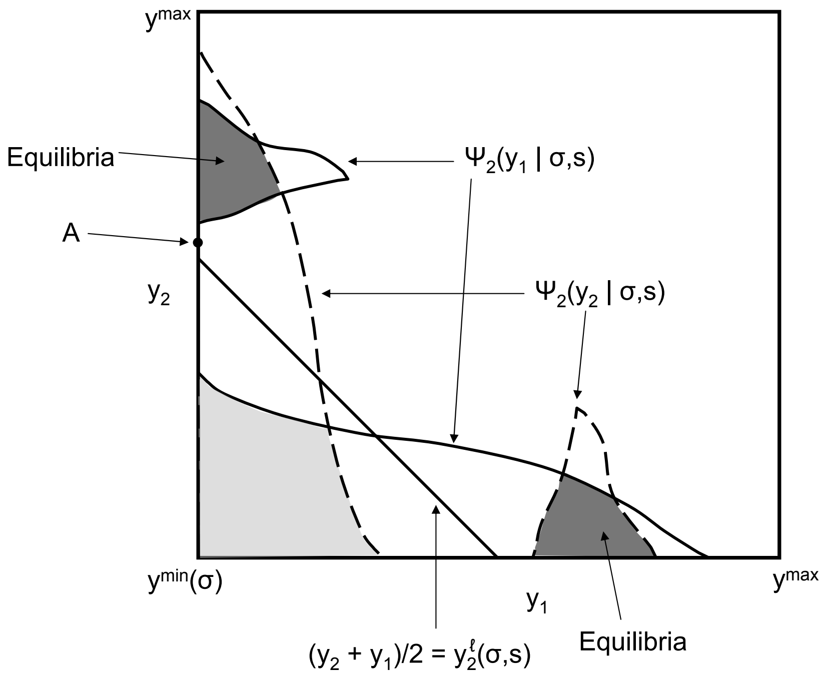

Figure 4: An Example with Only Asymmetric Two-Candidate Equilibria

dates must be willing to run against each other, a property that is only satisfied by points in the light- or dark-shaded areas. The figure also shows the non-candidate incentive constraint, expression (10), which simply requires $\frac{y_1+y_2}{2} \geq y_2^\ell(\sigma, s)$. Thus the set of equilibrium quality pairs corresponds to the set of points in the dark-shaded area of the figure.

Two features of Figure 3 merit notice. First, the incentive constraints for candidates bound average quality from above, while the incentive constraints for non-candidates bound average quality from below. Thus, in a multi-candidate equilibrium, the candidate pool tends to be of intermediate quality: neither too good (or opponents would drop out) nor too bad (or others would enter). Both bounds reflect the same practical consideration: potential candidates are less (more) likely to run for office if they are generally satisfied (dissatisfied) with the state of governance. Second, because the upper and lower boundaries on the set of equilibrium quality pairs slope downward, there will tend to be negative correlation between public-spiritedness and honesty among candidates, even if those characteristics are unrelated in the population from which candidates are drawn.

In Figure 3, there are both symmetric and asymmetric equilibria. Figure 4 illustrates a case in which *all* equilibria are asymmetric. In drawing the figure, we have assumed that due to relatively unfavorable entry conditions, there are values of a for which

$I(a, 0 \mid y^{\min}(\sigma), \sigma, s) < Nk$, which accounts for the non-convexity of $\Psi_N(y^{\min}(\sigma) \mid \sigma, s)$. Only quality pairs in the darkly-shaded regions are sustainable as equilibria: points in the lightly-shaded region satisfy the candidate incentive constraints, but not the non-candidate incentive constraint.[29] In such cases, equilibria give rise to substantial random variation in the quality of governance from election to election. This is not merely a technical curiosity; in Subsection 4.4, we will see that typically only analogs of these asymmetric equilibria survive as the costs of running for office become small.

Next we examine the effects of the policy variables s and σ. Analysis of the best equilibria is straightforward because only the candidate incentive constraint (10) can bind. Analysis of the worst equilibria is complex because there are three distinct possibilities: the non-candidate incentive constraint (10) binds, in which case $\underline{y}_N(\sigma, s) = y_N^\ell(\sigma, s)$ (as in Figure 3); the candidate incentive constraint (7) binds (as in Figure 4); or neither constraint binds, in which case $\underline{y}_N(\sigma, s) = y^{\min}(\sigma)$. Our key conclusions are summarized as follows:

Theorem 1. *Suppose N-candidate equilibria exist for policies (σ, s), (σ', s), and (σ, s'), where $\sigma < \sigma'$ and $s < s'$ (so that a change from (σ, s) to (σ', s) entails an increase in anti-corruption enforcement, and a change from (σ, s) to (σ, s') entails an increase in the governor's compensation). Then:*

(i) The best N-candidate equilibrium is no better with higher anti-corruption enforcement ($\overline{y}_N(\sigma, s) \geq \overline{y}_N(\sigma', s)$), and is better with higher compensation ($\overline{y}_N(\sigma, s) \leq \overline{y}_N(\sigma, s')$, with strict inequality when $\overline{y}_N(\sigma, s) < y^{\max}$).

(ii) The worst N-candidate equilibrium is:

(ii-a) worse with higher anti-corruption enforcement ($\underline{y}_N(\sigma, s) > \underline{y}_N(\sigma', s)$), and better with higher compensation ($\underline{y}_N(\sigma, s) < \underline{y}_N(\sigma, s')$) if the only binding constraints at the worst equilibria are the non-candidate incentive constraints (10);[30]

(ii-b) better with higher anti-corruption enforcement ($\underline{y}_N(\sigma, s) < \underline{y}_N(\sigma', s)$) and unchanged with higher compensation ($\underline{y}_N(\sigma, s) = \underline{y}_N(\sigma, s')$) if the only binding constraints at

[29] Figure 4 therefore illustrates the possibility that the candidate incentive constraint, rather than the non-candidate incentive constraint, may determine the lower bound on the expected quality of governance. For instance, consider the point A in the figure: since it is above the line $\frac{y_1+y_2}{2} = y_2^l(\sigma, s)$, the non-candidate incentive constraints are satisfied; yet it has a lower expected quality of governance than any of the equilibria. It is not an equilibrium because candidate 2's incentive constraint is not satisfied.

[30] To be clear, this statement requires that, both before and after the policy change, the only binding constraints at the worst equilibria are the non-candidate incentive constraints. If the requirement is satisfied for the initial policy, it is always satisfied for the final policy as well if the change is small. A similar clarifying remark applies to parts (ii-b) and (ii-c).

the worst equililbria are the minimal quality levels (that of Scoundrels);

(ii-c) no worse with higher anti-corruption enforcement ($\underline{y}_N(\sigma, s) \leq \underline{y}_N(\sigma', s)$) and worse with higher compensation ($\underline{y}_N(\sigma, s) \geq \underline{y}_N(\sigma, s')$, with strict inequality when $\underline{y}_N(\sigma, s) > y^{\min}(\sigma)$) if the only binding constraints at the worst equilibria are the candidate incentive constraints (7), and the changes ($\sigma' - \sigma$ and $s' - s$) are sufficiently small.

Notice that the direction of the effect on the worst equilibria depends on which constraint binds. Focusing on the "typical" case in which the non-candidate incentive constraint binds at the worst equilibria (as in Figure 3), we see that both the best and worst N-candidate equilibria (weakly) worsen with greater anti-corruption enforcement. In contrast, both (weakly) improve with an increase in the governor's compensation. For the other two cases — when either the overall lower bound on quality or the candidate incentive constraint binds at the worst equilibria — the direction of the effects on the worst equilibria reverse (with one exception, where there is no effect). The remainder of this section explains these results.

With respect to the worst equilibria, cases (ii-a) and (ii-b) also arose with single-candidate equilibria, and the results here hold for precisely the same reasons. That leaves part (i) and case (ii-c), both of which are governed by the candidate incentive constraint. Consider first the effects of the governor's compensation, s. Condition (12) implies that that if $s' > s''$, then $\Psi_N(y \mid \sigma, s'') \subseteq \Psi_N(y \mid \sigma, s')$, i.e., the set of willing-candidate quality levels expands with s. Clearly, an expansion of $\Psi_2(y_1 \mid \sigma, s)$ and $\Psi_2(y_2 \mid \sigma, s)$ in Figures 3 or 4 would increase the expected quality of governance in the best equilibrium and (weakly) reduce it in the worst. Next consider anticorruption enforcement, σ. As argued in the next paragraph, if $\sigma' > \sigma''$, then $\Psi_N(y \mid \sigma', s) \subseteq \Psi_N(y \mid \sigma'', s)$, i.e., the set of willing-candidate quality levels contracts with σ. Consequently, the effects of σ are opposite those of s.[31]

To understand why $\Psi_N(y \mid \sigma', s) \subseteq \Psi_N(y \mid \sigma'', s)$ for $\sigma' > \sigma''$, suppose a candidate with character (a, h') is willing to run against $N - 1$ opponents of average quality y when the enforcement level is σ'. Then there is some $h'' > h'$ such that an (a, h'')-candidate's disutility from selling out under policy σ'' is the same as the (a, h')-candidate's disutility from selling out under policy σ' (i.e., $g(h'', \sigma'') = g(h', \sigma')$). Because quality depends on

[31] If the set of equilibrium expected quality levels is non-convex, changes in $\underline{y}_N(\sigma, s)$ and $\overline{y}_N(\sigma, s)$ do not completely characterize the effects of σ on the range of expected governance quality. Suppose the set in question is a sequence of disjoint intervals. In that case, an increase in s (resp. σ) increases (resp. decreases) the upper bound of every interval, and decreases (resp. increases) the lower bound (some of those effects being strict and some weak). Additional intervals may also appear.

h and σ only through g, the (a, h'')-candidate's quality under policy σ'' is the same as the (a, h')-candidate's quality under policy σ'. Finally, because a candidate's incentive to enter, $I(a, h \mid y, \sigma, s)$, also depends on h and σ only through g, the fact that the (a, h')-candidate's incentive exceeds Nk under policy σ' implies that the (a, h'')-candidate's incentive exceeds Nk under policy σ''.

4.3 Effects on the Number of Candidates

So far, we have focused on policy effects holding fixed the number of candidates, N. Unless a policy change affects the existence of equilibria for some N, the previous section's characterizations of comparative statics for the overall best and worst equilibria continue to apply. However, a policy change may force a change in the number of candidates by altering the set of N for which equilibria exist.

It is easy to check that if $N' > N$, then $y_N^\ell(\sigma, s) > y_{N'}^\ell(\sigma, s)$ (from the definition in (10)) and $\Psi_{N'}(y \mid \sigma, s) \subseteq \Psi_N(y \mid \sigma, s)$ (since the only change is a lower probability of winning). Also, N does not affect the quality of any given candidate. Thus, the effects of N and s are similar, except that the directions are reversed.[32] Subject to the qualifications noted in our discussion of Theorem 1, an increase in N therefore tends to reduce both the highest and lowest quality achievable in equilibrium (assuming the non-candidate incentive constraint binds).

Intuitively, increases in s make entry more attractive, potentially eliminating equilibria with smaller numbers of candidates, and introducing equilibria with larger numbers of candidates; increases in σ have the opposite effect. It follows that effects on the quality of governance flowing through selection effects that result from changes in N tend to work in the *opposite* direction from the effects examined in the previous section. Thus, the overall effects of the governor's compensation and anti-corruption enforcement on the quality of governance are surprisingly complex, and subtle technical issues arising from the presence of integer constraints (including implications for existence of equilibria) render them difficult to assess. Fortunately, as we show in the next section, the task of evaluating all the pertinent effects in combination becomes tractable when the costs of running for office are treated as vanishingly small, a common assumption in the citizen-candidate literature.

[32] In fact, increasing N has the same effect on the non-candidate incentive constraint (10) as reducing s by $(N+1)k$, and it has the same effect on the candidate incentive constraint (7) as reducing s by Nk.

4.4 Equilibria with Small Entry Costs

We now examine the behavior of the model as k becomes vanishingly small. First we note that the analysis of single-candidate equilibria is essentially unchanged from Subsection 4.1. From expression (11), an equilibrium with a single candidate of quality y exists for arbitrarily small k if and only if

$$y \geq \max\left\{\frac{u^G\left(1,0 \mid \sigma, s\right)}{2}, u^G(0,0 \mid \sigma, s)\right\} =: \widehat{y}(\sigma, s). \tag{14}$$

It follows that $y^{\max} \geq \widehat{y}(\sigma, s)$ is a necessary and sufficient condition for the existence of single-candidate equilibria in the limit. Moreover, for any candidate with quality in the interval $[\widehat{y}(\sigma, s), y^{\max}]$, there exists such an equilibrium. Thus, small entry costs do not generally resolve the multiplicity issue for single-candidate equilibria.

Next we examine equilibria with more than one candidate. Due to integer constraints, we are unable to derive general conditions that guarantee the existence of pure strategy equilibria. Consequently, we now broaden the scope of our analysis to include mixed strategy equilibria, which allows us to assure existence.

We focus on equilibria in which insiders probabilistically run for office if and only if they belong to a finite or countably infinite set of potential candidates. Formally, a mixed strategy equilibrium consists of a denumerable set $\mathcal{N}$ of cardinality $N := |\mathcal{N}| \in \mathbb{N} \cup \{+\infty\}$, plus an N-dimensional vector $\mu = (\mu_i)_{i\in\mathcal{N}}$, where each $\mu_i \in (0, 1]$ is the probability of the respective insider running. Insiders not in $\mathcal{N}$ run with zero probability. Note that this formulation subsumes pure strategy equilibria. The probabilities of running translate into probabilities of winning conditional on running for each $i \in \mathcal{N}$, denoted $\rho_i\left(\mathcal{N}, \mu\right)$.[33] The unconditional probability of i winning in equilibrium is $\mu_i\rho_i\left(\mathcal{N}, \mu\right)$. In addition, we use $y_{\text{avg}}\left(\mathcal{N}, \mu\right) := \sum_{j\in\mathcal{N}} \mu_j\rho_j\left(\mathcal{N}, \mu\right) y^j + [1 - \sum_{j\in\mathcal{N}} \mu_j\rho_j\left(\mathcal{N}, \mu\right)]y_A$ to denote the expected quality of governance when the set $\mathcal{N}$ runs with probabilities μ, where y_A is the quality of governance when there is no governor (which, recall, is assumed to be extremely dire).

Henceforth $\mu(-i)$ will denote the probability vector obtained from μ by deleting the element containing the probability of entry for $i \in \mathcal{N}$. Thus, if $i \in \mathcal{N}$ changes his probability of entry from μ_i to zero, the conditional probability of winning for any $j \in \mathcal{N}\backslash i$ changes

[33] The probability of winning for any set of realized candidates remains uniform, but the realized number of candidates is now stochastic; $\rho_i\left(\mathcal{N}, \mu\right)$ encompasses both sources of randomness. Note that $\rho_i\left(\mathcal{N}, \mu\right)$ depends on $(\mu_j)_{j\in\mathcal{N}\backslash i}$ but not on μ_i.

to $\rho_j(\mathcal{N}\backslash i, \mu(-i))$. Likewise, $\mu(+i)$ will denote the probability vector obtained from μ by adding an element indicating that $i \notin \mathcal{N}$ enters with probability one. Thus, if $i \notin \mathcal{N}$ changes his probability of entering from zero to one, the conditional probabilities of winning for any $j \in \mathcal{N} \cup i$ is $\rho_j(\mathcal{N} \cup i, \mu(+i))$.

Note that, because all choices and electoral events are independent, the probability of $j \in \mathcal{N}$ winning conditional on the event that $i \in \mathcal{N}$ does not win is equal to the probability of $j \in \mathcal{N}$ winning when i does not run, which is $\mu_j \rho_j(\mathcal{N} \setminus i, \mu(-i))$. This implies in particular that $\mathbb{E}[y \mid (\mathcal{N}, \mu), \text{ and } i \in \mathcal{N} \text{ does not win}] = y_{\text{avg}}(\mathcal{N}\backslash i, \mu(-i))$. As a result, for $i \in \mathcal{N}$, we have

$$y_{\text{avg}}(\mathcal{N}, \mu) = \rho_i(\mathcal{N}, \mu) y^i + (1 - \rho_i(\mathcal{N}, \mu)) y_{\text{avg}}(\mathcal{N}\backslash i, \mu(-i)). \tag{15}$$

The equilibrium conditions for mixed strategies resemble those for pure strategies. Since the expected quality of governance is the same regardless of whether i runs and loses or refrains from running, i's decision is governed by a comparison between k (the cost of running), and the probability of winning multiplied by i's gains conditional on winning. Analogous to (7), the incentive constraint for those who (probabilistically) enter is thus:

$$\forall i \in \mathcal{N}: \quad \rho_i(\mathcal{N}, \mu) \left[u^G \left(a^i, h^i \mid \sigma, s \right) - (1 + a^i) y_{\text{avg}}(\mathcal{N}\backslash i, \mu(-i)) \right] \geq k, \tag{16}$$

with equality when $\mu_i < 1$. For those who do not enter, analogous to (8), the incentive constraint is:

$$\forall i \notin \mathcal{N}: \quad \rho_i(\mathcal{N} \cup i, \mu(+i)) \left[u^G \left(a^i, h^i \mid \sigma, s \right) - (1 + a^i) y_{\text{avg}}(\mathcal{N}, \mu) \right] \leq k. \tag{17}$$

Since $\rho_i(\cdot, \cdot)$ does not depend on a candidate's character, Lemma 2 continues to apply (with the obvious notational changes), so (17) holds if and only if it is satisfied for Sell-Outs and Scoundrels.

We are not aware of an equilibrium existence result that applies to the current framework.[34] We therefore begin by assuring existence of mixed strategy equilibria (which subsume pure strategy equilibria).

Lemma 3. *For any $k > 0$, a mixed strategy equilibrium exists.*

[34]Following Schmeidler (1973), existence results in games with a continuum of players generally assume that choices by a measure zero set of opponents do not affect a player's payoff. That requirement is obviously not satisfied here: for example, if an insider chooses to run, his (expected) payoff depends on the exact number and identities of opponents.

Recall that single-candidate equilibria do not exist for k sufficiently small if $y^{\max} < \widehat{y}(\sigma, s)$. Consequently, under those conditions all equilibria must involve potential entry by multiple candidates. Henceforth we will refer to any equilibrium $(\mathcal{N}, \mu)$ with $N > 1$ as a *multiple-candidate equilibrium.*

In the remainder of the section we focus on $y^{\max} < \widehat{y}(\sigma, s)$ and explore the properties of multiple-candidate equilibria when the cost of running for office becomes vanishingly small. Our first characterization result establishes that, for each insider who runs for office (with any positive probability), the expected probability of winning conditional on running converges to zero as $k \to 0$. Clearly, this implies in turn that the expected number of candidates must grow without bound as running costs vanish. Formally:

Lemma 4. *For any $\varepsilon > 0$, there exists $\hat{k}(\varepsilon)$ such that for all $k < \hat{k}(\varepsilon)$, every multiple-candidate equilibrium $(\mathcal{N}, \mu)$ satisfies $\rho_i(\mathcal{N}, \mu) < \varepsilon$ for all $i \in \mathcal{N}$.*

The intuition for this result is most transparent when all candidates are of the same character. In that case, the incentive constraint for non-candidates, expression (16), is virtually identical in the limit to the incentive constraint for candidates, expression (17), except that the direction of the inequality is reversed. Thus, if the N-th candidate is willing to run, an identical $(N+1)$-th candidate would also enter.

In light of Lemma 2 and Lemma 4, intuition suggests that as the cost of running for office approaches zero, the character of every candidate must approach that of either a Scoundrel or a Sell-Out in any multiple-candidate equilibrium. For, if a candidate were of any other type, then with many candidates, an additional candidate — either a Scoundrel or a Sell-Out — would necessarily have an incentive to enter, breaking the equilibrium. Indeed:

Theorem 2. *For any $\varepsilon > 0$, there exists $\hat{k}(\varepsilon) > 0$ such that when $k < \hat{k}(\varepsilon)$, any multiple-candidate equilibrium, $(\mathcal{N}, \mu)$, satisfies: if $n \in \mathcal{N}$, then $(a^n, h^n) \in B_\varepsilon(1,0) \cup B_\varepsilon(0,0)$, where $B_\varepsilon(a,h)$ denotes an open ball of radius ε around the point (a,h).*

Having determined that all candidates must be either Sell-Outs or Scoundrels in the limit, we can now characterize the expected quality of governance. Recall from Lemma 2 that $y^*(\sigma)$ is the quality of governance that equalizes the incentives to enter for Sell-Outs and Scoundrels; for $y > y^*(\sigma)$, Scoundrels have greater incentive to enter than Sell-Outs, and vice versa for $y < y^*(\sigma)$. Define

$$\widetilde{y}(\sigma) := \max\left\{y^{\min}(\sigma), \min\{y^*(\sigma), Y(1,0|\sigma)\}\right\}. \tag{18}$$

In other words, $\widetilde{y}(\sigma)$ truncates $y^*(\sigma)$ below at the quality of a Scoundrel, and above at the quality of a Sell-Out.

Theorem 3. *For any $\varepsilon > 0$, there exists $k'(\varepsilon) > 0$ such that when $k < k'(\varepsilon)$, any multiple-candidate equilibrium, $(\mathcal{N}, \mu)$, has $|y_{avg}(\mathcal{N}, \mu) - \widetilde{y}(\sigma)| \leq \varepsilon$.*

Thus, when the costs of running for office are sufficiently small, the expected quality of governance in any multiple-candidate equilibrium is approximately $\widetilde{y}(\sigma)$. To build intuition, suppose that $y^{\min}(\sigma) < y^*(\sigma) < Y(1, 0 \mid \sigma)$. We know from Theorem 2 that only Sell-Outs and Scoundrels run for office. Clearly, the equilibrium cannot consist of all Scoundrels, because then we would have $y_{\text{avg}}(\mathcal{N}, \mu) = y^{\min}(\sigma) < y^*(\sigma)$, which implies that Sell-Outs would have greater incentive to enter than Scoundrels (by Lemma 2). Similarly, the equilibrium cannot consist of all Sell-Outs, because then we would have $y_{\text{avg}}(\mathcal{N}, \mu) = Y(1, 0|\sigma) > y^*(\sigma)$, which implies that Scoundrels would have greater incentive to enter than Sell-Outs (again by Lemma 2). Thus, the equilibrium must involve a mixture of Scoundrels and Sell-Outs. To preserve a mixture in the limit, Scoundrels and Sell-Outs must have the same incentives to enter, which implies that $y_{\text{avg}}(\mathcal{N}, \mu) = y^*(\sigma)$.

Together, Theorems 2 and 3 have a surprising and important implication: with small entry costs, the quality of governance is typically highly variable.[35] Though all candidates are maximally dishonest, they vary widely in public spirit. A given election can yield a governor with either extremely high or extremely low public spirit (Sell-Outs or Scoundrels), and hence either the maximum or minimum level of the public good. Thus, analogs of the asymmetric equilibria identified in Subsection 4.2 typically turn out to be the only ones that survive in the limit. It is worth remembering, however, that when entry costs are not small, asymmetric equilibria can also yield substantial variability with respect to the governor's honesty; it is only as $k \to 0$ that all candidates necessarily become maximally dishonest.

We can now readily determine the limiting distribution of candidates' character types. Let γ^* denote the limiting fraction of candidates who are Sell-Outs. Then

$$\widetilde{y}(\sigma) = \gamma^* \left[f(e^*(1)) - q \left(1 - \Phi\left(v^*(1, 0, \sigma)\right)\right)\right] + (1 - \gamma^*) \left[f(e^*(0)) - q \left(1 - \Phi\left(v^*(0, 0, \sigma)\right)\right)\right].$$

Rearranging yields

$$\gamma^*(\sigma) = \frac{\widetilde{y}(\sigma) - \left[f(e^*(0) - q\left(1 - \Phi\left(v^*(0, 0, \sigma)\right)\right)\right]}{f(e^*(1)) - f(e^*(0))}. \tag{19}$$

[35] "Typically" because this is true so long as $y^*(\sigma) \in (y^{\min}(\sigma), Y(1, 0|\sigma))$.

Theorem 3 also allows us to determine the effects of our two public policy instruments, s and σ, on the expected quality of governance in the limit when k becomes small, assuming when $y^{\max} < \widehat{y}(\sigma, s)$.[36] We begin with s, the governor's compensation. Observe that $\widetilde{y}(\sigma)$ is independent of s because $y^*(\sigma)$, $y^{\min}(\sigma)$, and $Y(1, 0 \mid \sigma)$ are all independent of s; hence, in the limit, changes in compensation have *no effect* on the expected quality of governance. The explanation for this finding is clear when the equilibrium consists of all Sell-Outs ($\widetilde{y}(\sigma) = Y(1, 0 \mid \sigma)$) or all Scoundrels ($\widetilde{y}(\sigma) = y^{\min}(\sigma)$): in such cases there are no candidate selection effects, and selection provides the only channel through which compensation can influence the quality of governance. When Sell-Outs and Scoundrels both run for office ($y^{\min}(\sigma) < y^*(\sigma) < Y(1, 0 \mid \sigma)$), selection effects are present but, in the limit, the typically beneficial effects of an increase in s for fixed N exactly offset the typically detrimental effects associated with stimulating additional entry.

Next we consider the effects of σ, the level of anti-corruption enforcement. Plainly, both $y^{\min}(\sigma)$ and $Y(1, 0 \mid \sigma)$ are strictly increasing in σ. Differentiating $y^*(\sigma)$ from (9), we obtain

$$\frac{dy^*}{d\sigma} = \alpha g_\sigma(0, \sigma) \left[\Phi(v^*(1, 0, \sigma)) - \Phi(v^*(0, 0, \sigma))\right] > 0. \tag{20}$$

It follows that $\widetilde{y}(\sigma)$ is also strictly increasing in σ. Thus, in the limit as the costs of running for office become vanishingly small, an increase in σ unambiguously improves the quality of governance. The explanation is again is clear when the equilibrium consists of all Sell-Outs or all Scoundrels: with no selection effects, an increase in σ must be beneficial because it reduces the influence of special interests on the governor's decisions. When Sell-Outs and Scoundrels both run for office with positive probability, both direct selection effects (fixing N) and indirect selection effects (through changes in N), which here are treated in combination, are also present. If an increase in σ reduced Scoundrels' and Sell-Outs' incentives to run for office by equal amounts, then the same expected quality of governance would continue to equalize those incentives, and the policy change would yield no benefits, despite a reduction in the propensity for any given governor to accommodate special interests (the mix would simply shift toward Scoundrels by an offsetting amount). But in fact, an increase in σ has a larger effect on the incentives to run for Scoundrels than for Sell-Outs. Thus, higher expected quality is required to restore equal incentives to run for office.

While the direction of this effect is consistent with simple intuition, the mechanism is

[36]Plainly, with small k, if $y^{\max} \geq \widehat{y}(\sigma, s)$ either an increase in s or a decrease in σ can shift the equilibrium from a single candidate to multiple candidates.

rather surprising. Notice that the effect of anti-corruption enforcement, σ, on candidate selection operates entirely through *public-spiritedness* (the mix of Scoundrels and Sell-Outs), rather than through *honesty* (given that all candidates are maximally dishonest in the limit). Also, recall from Theorem 1 that if the number of candidates is held fixed, the positive influence of anti-corruption enforcement on a governor's incentives are typically more than offset by perverse direct selection effects. Thus, for a wide range of parameter values, anti-corruption enforcement is on balance beneficial only because it also reduces the number of candidates in equilibrium, thereby *indirectly* improving selection.

It is generally ambiguous whether an increase σ on balance raises or lowers γ^*, the ratio of Sell-Outs to Scoundrels among candidates; i.e., whether the indirect selection effects (associated with changes in N) are larger or smaller than the direct selection effects (for a fixed N). We evaluate the combined selection effects by differentiating γ^* with respect to σ (assuming it is interior):[37]

$$\frac{d\gamma^*}{d\sigma} = \frac{g_\sigma(0,\sigma)\left(\alpha\left[\Phi(v^*(1,0,\sigma)) - \Phi(v^*(0,0,\sigma))\right] - q\phi\left(g(0,\sigma)+q\right)\right)}{f(e^*(1)) - f(e^*(0))}. \tag{21}$$

Suppose the density $\phi(v)$ is constant, say equal to $\overline{\phi}$, on $[v^*(0,0,\sigma), v^*(1,0,\sigma)]$. Then (21) reduces to $\frac{d\gamma^*}{d\sigma} = \frac{g_\sigma(0,\sigma)q(\alpha-1)\overline{\phi}}{f(e^*(1))-f(e^*(0))} < 0$, so long as $\alpha < 1$. A fortiori, if the density $\phi(v)$ is non-increasing on $[v^*(0,0,\sigma), v^*(1,0,\sigma)]$, then in the limit as k becomes vanishingly small, raising σ generates an *unfavorable overall* selection effect with respect to public-spiritedness.[38] To reconcile this observation with our preceding discussion, note that even though the overall selection effect is unfavorable, the (beneficial) indirect selection from the reduced number of candidates provides enough of an offset to the (detrimental) direct selection effect so that when combined with the (beneficial) incentive effect on any governor's behavior, the net effect on expected governance quality is positive.

On the other hand, it is evident from (21) that reasonable parameters can also yield $\frac{d\gamma^*}{d\sigma} > 0$, for example if the density $\phi(v)$ is sufficiently increasing on the relevant interval. In these cases, as k becomes vanishingly small, a stronger anti-corruption policy generates a beneficial overall selection effect, because the indirect selection effect dominates the direct selection effect.

[37]Equation (21) is derived from (19) by noting that an interior γ^* requires $\tilde{y}(\sigma) = y^*(\sigma)$ and then using the derivative computed in (20).

[38]More generally, we see from (21) that for any given distribution $\Phi(v)$, there will be an unfavorable overall selection effect if α, the governor's bargaining power, is sufficiently small.

The following corollary summarizes our policy conclusions:

Corollary 1. *If $y^{\max} < \widehat{y}(\sigma, s)$, then in the limit as the costs of running (k) become vanishingly small (so that only multi-candidate equilibria exist), an increase in anti-corruption enforcement (σ) strictly increases the expected quality of governance but may increase or decrease the fraction of Sell-Outs relative to Scoundrels, while a change in the governor's compensation (s) has no impact on the expected quality of governance or the composition of the candidate pool.*

4.5 An Extension: Observably Differentiated Candidates

So far we have assumed that the electorate cannot distinguish at all between (non-incumbent) candidates' character. In practice, information concerning candidates' personal backgrounds and track records in other positions may be available, and this has been found to influence voters' choices (e.g. Banerjee et al., 2010, 2011). Indeed, some scholars argue that elections for lower office may improve electoral outcomes for higher office by providing opportunities for candidates to establish reputations, thereby beneficially filtering the set of candidates (e.g. Cooter, 2003; Myerson, 2006). We examine these possibilities here by extending our model to allow for observable differences among candidates.

If we assumed that the electorate observed each candidate's character perfectly, our results would change dramatically: in every equilibrium all candidates would necessarily be of the same quality, and there would always be equilibria in which only Saints run. However, we will show that neither the analysis nor conclusions change significantly when the electorate observes an imperfect indicator of each candidate's character, so long as the information is inconclusive in a sense made precise below. Moreover, perhaps surprisingly, a change in the information structure (such as the provision of more extensive background information) may have *no effect* on the set of equilibrium candidate-character profiles.

Let β be an observable parameter that encapsulates the past track record of any particular insider. We will make the following weak but critical assumption: the distribution of (a, h) has full support on $[0, 1] \times [0, 1]$ for all β.[39] In other words, no track record allows a voter to rule out with certainty the possibility that an insider is of any given type; it is in this sense that observable information is inconclusive.

[39] Note that this assumption rules out the case where (a, h) is perfectly observable. Moreover, we implicitly assume that there is a continuum of insiders with each possible β.

The introduction of observable differences among candidates potentially complicates the analysis of equilibria. Without such differences, all candidates are indistinguishable, and hence must have the same probability of winning on and off the equilibrium path. With observable differences, the probability with which a candidate wins can depend upon his observable β, and the manner in which the probabilities vary with β both on and off the equilibrium path will depend on the electorate's beliefs.

Begin by assuming that β is a scalar that lies in the normalized interval $[0, 1]$, and that a higher value of β indicates a better quality distribution (for example, in the sense of first-order stochastic dominance). It is straightforward that, for any equilibrium of the model without observable differentiation, there is an equivalent equilibrium under observable differentiation in which all candidates have the best possible track records ($\beta = 1$), but their underlying character types are precisely the same as in the original equilibrium. This equilibrium can be sustained by the intuitively plausible off-path belief that expected quality (and hence the probability of winning) is non-decreasing in β. Furthermore, the converse is also true: any equilibrium under observable differentiation in which all candidates have the same track record is also an equilibrium of the original model.

Naturally, in constructing equilibria, one has latitude in specifying the electorate's off-path beliefs (e.g., for an entrant with an unexpected track record). We now argue that a more systematic treatment of beliefs introduces one additional constraint but otherwise leaves our analysis unchanged. Suppose a multi-candidate equilibrium calls for a candidate pool $\mathcal{N}$ where all candidates have the best possible track records, but in fact there is one additional and unexpected candidate with $\beta < 1$. It is natural to assume that the voters' beliefs concerning the expected candidates with $\beta = 1$ are unchanged from the equilibrium path. Reasoning along the lines of the widely-applied D1 criterion (Cho and Kreps, 1987), we posit that voters attribute the unexpected entry to a candidate whose character provides the "greatest" or "most robust" incentive to enter, i.e. the type that would enter for the lowest probability of electoral success. By Lemma 2, the unexpected entrant is then seen as a Scoundrel if $y^{\mathcal{N}} > y^*(\sigma)$, as a Sell-Out if $y^{\mathcal{N}} < y^*(\sigma)$, and as either of these two if $y^{\mathcal{N}} = y^*(\sigma)$. If $y^{\mathcal{N}} \geq y^*(\sigma)$, the inference that an unexpected entrant is a Scoundrel implies that he loses for sure; this obviously deters entry and preserves the original equilibrium. If $y^{\mathcal{N}} < y^*(\sigma)$, the inference that an unexpected entrant is a Sell-Out implies that he loses if $y^{\mathcal{N}} > Y(1, 0|\sigma)$ and wins if $y^{\mathcal{N}} < Y(1, 0|\sigma)$; consequently, entry can be deterred if and only if $y^{N} \geq Y(1, 0|\sigma)$.[40] Thus, with the proposed belief restriction, there is one added constraint

[40]The "only if" conclusion uses the hypothesis that the putative equilibrium has multiple candidates

on average quality in a multi-candidate equilibrium: $y^{\mathcal{N}} \geq \widetilde{y}(\sigma)$.[41]

Arguing exactly as above, one can show that, for any multi-candidate equilibrium of the model without observable differentiation satisfying $y^{\mathcal{N}} \geq \widetilde{y}(\sigma)$, there is an equivalent equilibrium of the model with observable differentiation satisfying the belief restriction in which candidates share *any* given track record $\beta \in [0, 1]$, not just $\beta = 1$.[42] This may initially seem counterintuitive because β correlates with quality. However, because the value of β has no direct bearing on equilibrium incentives for any character type, the correlation is neutralized in equilibrium by self-selection effects. For the same reason, these conclusions also hold even if β is not a scaler and its relation to the distributions of a and h is arbitrary. This observation reveals that the new equilibrium constraint, $y^{\mathcal{N}} \geq \widetilde{y}(\sigma)$, arises purely from the conjunction of the belief restriction and the assumption that candidates have observed *labels* (e.g., last names); there is no requirement that the labels bear any relationship to underlying character.[43]

These findings have surprising implications for public policy. First, policies requiring the disclosure of background information concerning political candidates may have little or no effect on the character of elected officials or the quality of governance. To put the matter starkly, the set of equilibria is identical regardless of whether β represents last names, or last names supplemented with criminal records (provided the full-support condition is satisfied).[44] Positive effects of information disclosures on voters' choices, as documented for example

($|\mathcal{N}| > 1$), because this ensures that a non-entrant Sell-Out strictly prefers to deviate and enter if he is guaranteed victory (given $y^N < y^*(\sigma)$). If instead $|\mathcal{N}| = 1$, then a different threshold is relevant because it is possible that no Sell-Out wishes to enter even if he is guaranteed victory.

[41] There is an analogous constraint for single-candidate equilibria.

[42] It is worth noting that in these equilibria, there is a discontinuity in the probability of electoral victory for an unexpected entrant at the track record, β, that is anticipated in equilibrium. This is because an unexpected entrant loses for sure if his track record is either above or below this β, but wins with probability $1/(N + 1)$ if his track record is precisely β. Some readers may regard this discontinuity as an awkward consequence of the assumption that indistinguishable candidates must win with equal probability.

[43] So far we have only discussed equilibria of the extended model where all candidates have a common track record. If one allows insiders to coordinate based on some signal that they observe but the electorate does not, there are also equivalent equilibria in which candidates have heterogeneous track records. To illustrate, consider any two-candidate equilibrium of the model without observable differentiation in which $y^{\mathcal{N}} \geq \widetilde{y}(\sigma)$. Even if the candidates are of different qualities, say y_1 and y_2, the coordinating signal gives rise to an equilibrium in which there is a 50% probability that the entering candidates have quality-track-record pairs (β_1, y_1) and (β_2, y_2), and a 50% probability that the pairs are (β_2, y_1) and (β_1, y_2). In this case, the electorate draws the same equilibrium inference about quality regardless of whether a candidate's track record is β_1 or β_2, so the two candidates can win with equal probability even though they have different track records. While coordinated entry is somewhat artificial, it stands in for the reasonable assumption that voters cannot determine which candidate fills which "equilibrium slot."

[44] Although such policies do not alter the set of equilibrium character pools, they may have an effect through equilibrium selection.

by Banerjee et al. (2010, 2011), may be rendered ineffective by selection effects once such disclosures are institutionalized. Thus, our analysis may help explain why Chemin (2008) finds no evidence that the election of criminal politicians increases bribe-taking in India following a 2003 Supreme Court ruling mandating that all political candidates reveal criminal records.[45] Second, our neutrality result provides a cautionary note to the notion that elections for lower office in decentralized democracies beneficially filter the set of candidates for higher office, as suggested for example by Cooter (2003) and Myerson (2006).

5 Incumbency and Term Limits

We now turn to the effects of incumbency on the quality of governance. Assuming character is at least partially revealed during a governor's first term, reelection opportunities can promote better governance through two channels. The first is mechanical: the electorate gains opportunities to reelect desirable incumbents. The second operates through self-selection effects: the benefits of running for office in the first place rise for high-quality candidates (for whom the odds of re-election are high) relative to low-quality candidates (for whom the odds are low). This section explores these effects and also identifies why, perhaps surprisingly, longer term limits can produce adverse selection effects. Throughout this section, to avoid uninteresting cases, we assume that $y^{\max} < \hat{y}(\sigma, s)$ and $y^{\min}(\sigma) < y^*(\sigma) < Y(1, 0 \mid \sigma)$.[46]

5.1 Self-Selection Benefits of Reelection Opportunities

The impact of incumbency on candidate selection is most easily illustrated through a simple "reduced form" extension of our basic model to two periods; subsequently we will discuss how to enrich it. Assume that a governor of quality y is re-elected with an exogenous probability $\Pi(y)$ that is non-decreasing in y, so that higher quality incumbents are re-elected (weakly) more frequently. Further assume that the net gains from holding office for two terms are $\lambda > 1$ times those from holding office for a single term. Thus, when the probability of winning

[45] In fact, Chemin finds that bribe-taking is lower when the victorious candidate has a criminal record, which he interprets as indicating that criminal officeholders reduce the prosecution of corruption.

[46] Recall that these conditions ensure that equilibria of the baseline model with vanishing running costs involve multiple candidates (the first inequality), with the candidate pool consisting of both Sell-Outs and Scoundrels (the second pair of inequalities).

conditional on running is ρ and the alternative quality of governance is y', a candidate with characteristics (a, h) will be willing to run if and only if

$$\rho(1 + \Pi(Y(a, h|\sigma))\lambda) \left[u^G(a, h \mid \sigma, s) - (1 + a)y'\right] \geq k.$$

The following result shows that if Sell-Outs are re-elected with strictly higher probability than near-Scoundrels, then for small running costs, the expected quality of governance in the first period of the two-period model is strictly higher than $y^*(\sigma)$, the expected quality of governance in the original model.

Theorem 4. *Suppose $\Pi(Y(1, 0 \mid \sigma)) > \Pi(y)$ for all y within some neighborhood of $y^{\min}(\sigma)$. Then for some $\varepsilon > 0$, there exists $k' > 0$ such that when $k < k'$, any multi-candidate equilibrium of the extended model, $(\mathcal{N}, \mu)$, has $y_{avg}(\mathcal{N}, \mu) \geq y^*(\sigma) + \varepsilon$.*

It follows that the ability to re-elect better governors has a beneficial selection effect on the candidate pool in non-incumbent elections, in addition to any direct benefit of re-electing good governors. The logic of this result is straightforward. With $\lambda = 0$ (in effect, the one-period model), the set of insiders with the greatest incentives to run consists of Sell-Outs alone when the average quality of governance, call it y, is less than $y^*(\sigma)$, and both Sell-Outs and Scoundrels when $y = y^*(\sigma)$. Thus, with strictly positive λ and $y \leq y^*(\sigma)$, Sell-Outs have strictly greater incentives to run than any lower quality candidate. Consequently, $y \leq y^*(\sigma)$ rules out the possibility that, with vanishingly small entry costs, any candidate of quality $y^*(\sigma)$ or lower would run. It follows that $y \leq y^*(\sigma)$ is not sustainable in equilibrium.

So far we have imposed transparent but exogenous assumptions concerning re-election bids. That is both a virtue and a limitation. It is not hard, however, to see that similar results hold when the second-period election is modeled explicitly. Assume for simplicity that a governor's character is necessary revealed while in office. Because the second period of the two-period model closely resembles the single-period model, the most natural continuation equilibrium has the property that the average quality of challengers (if any run) is $y^*(\sigma)$; the incumbent runs for re-election if and only if his quality is at least $y^*(\sigma)$, and he wins when he runs.[47] Thus, $\Pi(\cdot)$ endogenously satisfies the assumption in Theorem 4. Though the

[47]To describe an equilibrium, one must specify voters' beliefs about the average quality of non-incumbent candidates for out-of-equilibrium realizations (i.e., ones in which the number of candidates falls outside the support of the equilibrium distribution). Unless one introduces belief restrictions, the set of equilibria is large, and many equilibria have implausible properties. We opted for the simple reduced-form model presented in the text to avoid a lengthy treatment of these technical and ultimately unenlightening complications.

benefits from holding office for two terms is no longer a fixed multiple of the benefits from holding office for a single term,[48], the main insight developed in the context of our simple reduced-form model — that re-election opportunities improve expected candidate quality in the first-period non-incumbent election — carries over, for essentially the same reasons. In some cases (e.g., when citizens heavily discount future payoffs), the first-period candidate pool still consists of only Sell-Outs and Scoundrels, but a higher fraction are Sell-Outs than in the one-period model. The fact that Sell-Outs seek and win re-election (whereas Scoundrels do not) bears out the adage that voters prefer a known crook to an unknown crook.

The two-period model is somewhat artificial because a non-incumbent candidate in the second period has no opportunity to seek re-election. This can be remedied by considering an infinite-horizon model but maintaining a two-term limit. Similar equilibria also exist in such a model. However, other types of equilibria also emerge, some with even higher governance quality. In the Supplementary Appendix, we restrict attention to Markovian equilibria (thereby ruling out equilibria that "bootstrap" cooperation through history-dependent strategies), and show that if second-term compensation is sufficiently high, there are equilibria that deliver any quality of governance between $[Y(1,0 \mid \sigma), y^{\max}]$ in every period.

5.2 Self-Selection Costs of Reelection Opportunities

The possibility of re-election can also have pernicious selection effects if lower-quality candidates benefit more from re-election than higher-quality candidates. Such effects can emerge if, as many have suggested, more senior politicians are able to extract greater pork and/or rents from holding office, e.g. by cultivating relationships with large contributors or obtaining appointments to powerful committees. To capture that possibility, we adopt the same simplifying framework (with exogenous re-election probabilities) and make the same assumptions as in Theorem 4, with the following exception: the fraction of lobbying surplus extracted by an incumbent governor, α_2, exceeds α, the fraction extracted by a first-term governor. With this modification, we obtain:

Theorem 5. *Assume $\alpha_2 > \alpha$. There exist $\varepsilon, \eta > 0$ and $\hat{k} > 0$ such that if $\Pi\left(y^{\min}(\sigma)\right) + \varepsilon > \Pi\left(y^{\max}\right) > 0$ and $k < \hat{k}$, any multi-candidate equilibrium of the extended model, $(\mathcal{N}, \mu)$, has $y_{avg}(\mathcal{N}, \mu) \leq y^*(\sigma) - \eta$.*

[48]This is because, in equilibrium, the expected quality of the non-incumbent candidate pools in the first and second periods will differ.

Thus, if incumbency confers additional bargaining power with special interests, then unless the electorate can differentiate sufficiently well between governors of good and bad character, the possibility of re-election causes adverse self-selection in non-incumbent elections. Intuitively, an increase in the governor's ability to extract rents from the lobby group resembles a decrease in anti-corruption policy: while it generally increases the benefits to holding office (fixing the quality of opponents), the effect on entry incentives is greatest for Scoundrels because they accept special interest transfers more often than all other types. Taking the boundary case where $\Pi(\cdot)$ is constant and $\alpha_2 = \alpha$, we know that the set of insiders with the greatest incentives to run consists of Scoundrels alone when the average quality of governance, call it y, is greater than $y^*(\sigma)$, and both Scoundrels and Sell-Outs when $y = y^*(\sigma)$. Thus, with $\alpha_2 > \alpha$ and $y \geq y^*(\sigma)$, Scoundrels have strictly greater incentives to run than any candidate of higher quality. Consequently, $y \geq y^*(\sigma)$ rules out the possibility that, with vanishingly small entry costs, any candidate of quality $y^*(\sigma)$ or higher would run. It follows that $y \geq y^*(\sigma)$ is not sustainable in equilibrium.

6 Concluding Remarks

We have examined the impact of special interest politics on the self-selected character of politicians, including honesty and public spirit. Our analysis emphasizes the role of selection effects in determining the quality of governance. The effects of public policy instruments, such as the level of the governor's compensation, the intensity of anti-corruption enforcement, and the disclosure of background information, turn out to be surprisingly subtle. Nevertheless, a number of robust (and in some cases unexpected) findings emerge, which we have summarized in the Introduction and hence will not repeat here. We conclude instead by mentioning some interesting avenues for future research.

The analysis in Section 5 illustrated how the possibility of re-election and incumbency can have both beneficial and adverse self-selection effects on the candidate pool, in addition to direct screening benefits. While we focussed for simplicity on making these points by comparing two-term limits with one-term limits, the findings suggest that it may be fruitful to explore more systematically the optimal length of term limits to balance out these opposing effects on self-selection.

We have assumed throughout that insiders differ only with respect to honesty and public-spiritedness. Another potentially interesting dimension along which candidates may differ is the relative weight they attach to monetary payments, public goods, effort, and honesty. To take a simple case, suppose insiders are differentiated by a third characteristic, $m \in [0, 1]$, that acts as a multiplier for all monetary payoffs (larger m indicating greater weight on money relative to other considerations). In multi-candidate equilibria, elections will tend to attract those with higher values of m. The potential implications for the effects of compensation and anti-corruption enforcement are intriguing. An increase in compensation, s, will tend to attract candidates with higher values of m, which is deleterious insofar as such individuals will more easily succumb to the influence of special interests. Thus, increasing compensation may *reduce* the quality of governance. On the other hand, increasing anti-corruption enforcement, σ, will not have that effect.

We have also assumed throughout that the special interest group interacts with politicians only after they gain office. In practice, such groups also encourage particular candidates to run for office by supporting their campaigns. In our model, lobbies plainly have incentives to reduce entry barriers for Scoundrels. The implications of allowing campaign contributions will depend on (i) the amount of information the lobby has about the candidate before he takes office, (ii) the likelihood that voters will observe the contributions, (iii) the extent to which the incentives to support a Scoundrel are diluted by the public goods problem among lobbies (all of which will prefer Scoundrels), and (iv) the extent to which public interest groups provide offsetting incentives.

Appendix A Notation

The table below provides a summary of notation regarding quality that is used throughout the paper.

Notation	**Meaning**	**Defined on page**
$Y(a, h)$	Quality of a citizen with character (a, h)	15
$y^{\min}(\cdot)$	Quality of a Scoundrel	15
$y^{\max}(\cdot)$	Quality of a Saint	15
$y^{\mathcal{N}}(\cdot)$	Expected quality when the candidate pool is known to be $\mathcal{N}$	15
$\overline{y}_N(\cdot)$	Highest expected quality achievable in an N-candidate pool	16
$\underline{y}_N(\cdot)$	Lowest expected quality achievable in an N-candidate pool	16
$y^*(\cdot)$	Expected quality that equalizes entry incentives for Scoundrels and Sell-Outs	16
$y_N^\ell(\cdot)$	Minimum expected quality of an N-candidate pool that is needed to satisfy no-entry incentive constraints	17
$y_{\text{avg}}(\cdot)$	Expected quality of the candidate pool when there is randomized entry	26
$\widehat{y}(\cdot)$	Minimum quality in a single-candidate equilibrium for vanishing running costs	26
$\widetilde{y}(\cdot)$	Expected quality that equalizes entry incentives for Scoundrels and Sell-Outs, but truncated below at the quality of a Scoundrel and above at the quality of a Sell-Out	29

Appendix B Proofs

Proof of Lemma 1. The first statement follows from the discussion of the Nash-bargaining outcome prior to the Lemma: if $v < v^*(a,h,\sigma)$, the governor does not implement the project; if $v > v^*(a,h,\sigma)$, he does and receives a transfer t such that $t - v^*(a,h,\sigma) = \alpha(v - v^*(a,h,\sigma))$. For the second statement, note that $1 - \Phi\left(v^*(a,h,\sigma)\right)$ is the probability of project implementation. Whenever the project is implemented, non-governor citizens with public spirit a' suffer a disutility of $(1+a')q$; thus, the citizen's expected cost is $(1+a')q\left[1 - \Phi\left(v^*(a,h,\sigma)\right)\right]$. □

Proof of Lemma 2. Fix the policies (σ, s) and define

$$\begin{aligned}\Delta(a,h,y) &:= u^G(a,h \mid \sigma,s) - (1+a)y \\ &= (1+a)\,f\left(e^*\left(a\right)\right) - c\left(e^*\left(a\right)\right) + \mathbb{E}_v \max\{\alpha(v - g(h,\sigma) - (1+a)q), 0\} + s - (1+a)y.\end{aligned}$$

Fix any y. The goal is to determine which pairs of (a,h) maximize $\Delta(\cdot,\cdot,y)$. Since $g(h,\sigma)$ is strictly increasing in h, $\Delta(a,h,y)$ is weakly decreasing in h; moreover, by Assumption 3, $\Delta(a,h,y)$ is strictly decreasing for h sufficiently small. Thus, for each a, $\Delta(a,h,y)$ is maximized uniquely at $h = 0$, so we can restrict attention to candidates with minimal honesty.

Note next that

$$\frac{\partial}{\partial a}\Delta(a,0,y) = f\left(e^*\left(a\right)\right) - \alpha q\left[1 - \Phi\left(g(0,\sigma) + (1+a)q\right)\right] - y,$$

and

$$\frac{\partial^2}{\partial a^2}\Delta(a,0,y) = f'(e^*(a))\frac{de^*(a)}{da} + \alpha q^2 \phi\left(g(0,\sigma) + (1+a)q\right) > 0.$$

Thus, the function $\Delta(a,0,y)$ is convex in a, hence is maximized only at either $a = 0$ or $a = 1$ (or both). The proof is completed by observing that

$$\Delta\left(1,0,y\right) - \Delta\left(0,0,y\right) = u^G(1,0|\sigma,s) - u^G(0,0|\sigma,s) - y = y^*(\sigma) - y,$$

where the 2nd equality is by the definition in (9). □

Proof of Theorem 1. The proof is via a number of steps.

Step 1: Suppose we have an N-candidate slate $\mathcal{N}'$ that satisfies the candidate incentive constraints with anti-corruption enforcement σ'. Then for $\sigma < \sigma'$ there exists an N-candidate slate $\mathcal{N}$ that satisfies the candidate incentive constraints with anti-corruption enforcement σ, such that $y^{\mathcal{N}}(\sigma) = y^{\mathcal{N}'}(\sigma')$.

For each $i \in \mathcal{N}'$, we claim that there exists some $j(i)$ with $a^{j(i)} = a^i$ such that

$$Y(a^{j(i)}, h^{j(i)} \mid \sigma) = Y(a^i, h^i \mid \sigma'). \tag{22}$$

To see this, note first that if $g(h^i, \sigma') + (1 + a^i)q \geq \overline{v}$, agent i would never implement the special-interest project, hence $Y(a, h \mid \sigma') = f(e^*(a^i))$. We can then take $j(i)$ such that $(a^{j(i)}, h^{(j(i)}) = (a^i, 1)$, since a maximally honest agent never implements special interest projects, no matter the level of anti-corruption enforcement (Assumption 3). So suppose that $g(h^i, \sigma') + (1 + a^i)q < \overline{v}$. Then, because $g(h^i, \sigma) < g(h^i, \sigma')$ while $g(1, \sigma) + (1 + a^i)q > \overline{v}$ (by Assumption 3), the continuity of $g(\cdot, \sigma)$ implies that there is some $h^* \in (h^i, 1)$ such that $g(h^*, \sigma) = g(h^i, \sigma')$. We choose $j(i)$ such that $(a^{j(i)}, h^{j(i)}) = (a^i, h^*)$.

Now we claim that, with anti-corruption enforcement σ, the slate $\mathcal{N} = \{j(1), \ldots, j(N)\}$ satisfies the candidate incentive constraint (7). To see this, observe that since (22) holds for $i = 1, ..., N$, we have that for any $i = 1, \ldots, N$,

$$\mathbb{E}_{k \in \mathcal{N}' \setminus i} u\left(a^k, h^k \mid a^i, \sigma'\right) = \mathbb{E}_{k \in \mathcal{N}' \setminus i} u\left(a^{j(k)}, h^{j(k)} \mid a^{j(i)}, \sigma\right) = \mathbb{E}_{k \in \mathcal{N} \setminus j(i)} u\left(a^k, h^k \mid a^{j(i)}, \sigma\right).$$

In other words, the expected candidate quality is the same if i withdraws from slate $\mathcal{N}'$ under σ', and if $j(i)$ withdraws from slate $\mathcal{N}$ under σ. Next note that for any $i = 1, \ldots, N$, the payoff to holding office, $u^G(a^i, h^i \mid \sigma', s) = u^G(a^{j(i)}, h^{j(i)} \mid \sigma, s)$ because, by construction, either (i) both i and $j(i)$ never accept lobby payments (under σ' and σ respectively), or (ii) $g(h^i, \sigma') = g(h^{j(i)}, \sigma)$. It now follows that the candidate incentive constraint (7) holds for all candidates in $\mathcal{N}$ under σ.

Step 2: Proof of parts (i) and (ii-c), with respect to anti-corruption enforcement.

First we prove the statements concerning the effects of a change in anti-corruption enforcement. Consider a change from (σ', s) to (σ, s) where $\sigma' > \sigma$, and where N-candidate equilibria exist in both cases. By Step 1, there exists an N-candidate slate $\mathcal{N}_A$ that satisfies the candidate incentive constraints under (σ, s) such that $y^{\mathcal{N}_A}(\sigma) = \overline{y}_N(\sigma', s)$, and an N-candidate slate $\mathcal{N}_B$ that satisfies the candidate incentive constraints under (σ, s) such that $y^{\mathcal{N}_B}(\sigma) = \underline{y}_N(\sigma', s) > y_N^{\ell}(\sigma', s)$ (where the inequality holds because the non-candidate incentive constraint is assumed not to bind).

Now consider part (i). Since the non-candidate incentive constraints amount to a lower bound, $y_N^\ell(\sigma, s)$, on equilibrium expected candidate quality under (σ, s), and because N-candidate equilibria are assumed to exist under (σ, s), either $\mathcal{N}_A$ is an equilibrium slate under (σ, s), or there is some other equilibrium slate under (σ, s) for which the expected candidate quality exceeds $y^{\mathcal{N}_A}(\sigma)$, and hence $\overline{y}_N(\sigma', s)$.

Now consider part (ii-c). Since $y_N^\ell(\sigma, s)$ is continuous, we have $y^{\mathcal{N}_B}(\sigma) = \underline{y}_N(\sigma', s) > y_N^\ell(\sigma, s)$ for $\sigma' - \sigma$ sufficiently small. Thus, $\mathcal{N}_B$ is an equilibrium slate under σ, and hence $\underline{y}_N(\sigma, s) \leq \underline{y}_N(\sigma', s)$.

Step 3: Suppose we have an N-candidate slate, $\mathcal{N}$, that satisfies the candidate incentive constraints with compensation s. Then for any $s' > s$, $\mathcal{N}$ satisfies the candidate incentive constraints with strict inequality from inspection of (7) and the observation that $u^G(a, h|\sigma, s\cdot)$ is strictly increasing in s.

Step 4: Proof of parts (i) and (ii-c), with respect to the governor's compensation.

Consider a change from (σ, s) to (σ, s') where $s' > s$, and where N-candidate equilibria exist in both cases. By Step 3, there exists an N-candidate slate $\mathcal{N}_A$ that strictly satisfies the candidate incentive constraints under (σ, s') such that $y^{\mathcal{N}_A}(\sigma) = \overline{y}_N(\sigma, s)$, and an N-candidate slate $\mathcal{N}_B$ that satisfies the candidate incentive constraints under (σ, s') such that $y^{\mathcal{N}_B}(\sigma) = \underline{y}_N(\sigma, s) > y_N^\ell(\sigma, s)$ (where the inequality holds because the non-candidate incentive constraint is assumed not to bind).

Now consider part (i). Assume first that $y_N^\ell(\sigma, s') \leq \overline{y}_N(\sigma, s) = y^{\mathcal{N}_A}(\sigma)$. In that case, $\mathcal{N}_A$ is an equilibrium slate under s'. Now suppose in addition that $\overline{y}_N(\sigma, s) < y^{\max}$. Because the candidate incentive constraints hold with strict inequality, and because u and u^G are continuous in a and h, there exists another slate, $\mathcal{N}_C$, for which $y^{\mathcal{N}_C}(\sigma) > \overline{y}_N(\sigma, s) \geq y_N^\ell(\sigma, s')$, and that satisfies the candidate incentive constraints. Plainly $\mathcal{N}_C$ is an equilibrium slate under s'. Next assume that $y_N^\ell(\sigma, s') > \overline{y}_N(\sigma, s) = y^{\mathcal{N}_A}(\sigma)$. In that case $\mathcal{N}_A$ is not an equilibrium slate under s', but we have assumed that an equilibrium slate, $\mathcal{N}_C$, exists, and it is necessarily the case that $y^{\mathcal{N}_C}(\sigma) \geq y_N^\ell(\sigma, s') > \overline{y}_N(\sigma, s)$.

Now consider part (ii-c). Because $y_N^\ell(\sigma, s)$ is continuous, we have $y^{\mathcal{N}_B}(\sigma) = \underline{y}_N(\sigma, s) > y_N^\ell(\sigma, s')$ for $s' - s$ sufficiently small. Thus, $\mathcal{N}_B$ is an equilibrium slate under σ. Next assume that $\underline{y}_N(\sigma, s) > y^{\min}(\sigma)$. Because the candidate incentive constraints hold with strict inequality, and because u and u^G are continuous in a and h, there exists another slate, $\mathcal{N}_C$, for which $\underline{y}_N(\sigma, s) > y^{\mathcal{N}_C}(\sigma) > y_N^\ell(\sigma, s')$, and that satisfies the candidate incentive constraints. Plainly $\mathcal{N}_C$ is an equilibrium slate under s'.

Step 5: Proofs of parts (ii-a) and (ii-b). For part (ii-a), we are to assume $\underline{y}_N(\sigma, s) = y_N^\ell(\sigma, s)$, $\underline{y}_N(\sigma', s) = y_N^\ell(\sigma', s)$, and $\underline{y}_N(\sigma, s') = y_N^\ell(\sigma, s')$. It is straightforward to check that u^G, and hence $y_N^\ell(\sigma, s)$, are strictly increasing in s and strictly decreasing in σ, from which part (ii-a) follows immediately. For part (ii-b), we are to assume $\underline{y}_N(\sigma, s) = \underline{y}_N(\sigma, s') = y^{\min}(\sigma)$ and $\underline{y}_N(\sigma', s) = y^{\min}(\sigma')$. Trivally, $y^{\min}(\sigma)$ is independent of s. Moreover, it is straightforward to check that $y^{\min}(\sigma)$ is strictly increasing in σ. □

Proof of Lemma 3. Fix any $k > 0$ and consider a sequence of restricted models, indexed by m, such that in model m there are $2m$ insiders, consisting of m Sell-Outs and m Scoundrels. For each restricted model in this sequence, the entry game is finite and hence a mixed-strategy equilibrium exists. Fix any selection of equilibria in the sequence of restricted models.

Case 1: Suppose first that, for some m, the equilibrium has at least one Sell-Out and at least one Scoundrel entering with zero probability. Then (16) is satisfied for all insiders who enter with strictly positive probability, and (17) is satisfied for all insiders who enter with zero probability. This equilibrium remains an equilibrium when any number of Sell-Outs and Scoundrels are added so long as they enter with zero probability: (16) is unaffected and therefore still satisfied for those who enter with positive probability; while (17) is unaffected and therefore still satisfied by the original insiders who enter with zero probability as well as the new insiders. By Lemma 2, it follows that (17) is also satisfied for any new insiders of other character types. Therefore, the equilibrium of model m is also an equilibrium of the unrestricted model, featuring a finite number of candidates.

Case 2: Now suppose that, for all m restricted models, either all Sell-Outs or all Scoundrels (or both) enter with non-zero probability. Let $\widehat{\theta}^m$ be the associated vector of entry probabilities for Sell-Outs, listed in non-increasing order, and let $\widehat{\tau}^m$ denote the associated vector of entry probabilities for Scoundrels, again listed in non-increasing order. Note that (16) implies that there must be strictly positive lower bound on the probability of winning conditional on running, and hence an upper bound, call it $C^{\max}$, on the expected number of candidates. Consequently, $\sum_{i=1}^{m}\left[\widehat{\theta}_i^m + \widehat{\tau}_i^m\right] \leq C^{\max}$.

For each m, define countably-infinite-dimensional vectors θ^m and τ^m such that $\theta_i^m = \widehat{\theta}_i^m$ and $\tau_i^m = \widehat{\tau}_i^m$ for $i = 1, ..., m$, and $\theta_i^m = \tau_i^m = 0$ for $i > m$. For any m, θ^m and τ^m lie in the space

$$\Theta := \left\{ (\theta_1, \theta_2, ...) \mid \sum_{i=1}^{\infty} \theta_i \leq C^{\max},\ \theta_i \geq 0, \text{ and } \theta_i \geq \theta_{i+1} \text{ for } i = 1, 2, ... \right\}.$$

A key property to note is:

$$\text{for any } \theta \in \Theta \text{ and any } i,\ \theta_i \leq \frac{C^{\max}}{i}, \tag{23}$$

because the elements are in non-increasing order and $\sum_i \theta_i \leq C^{\max}$. Endow Θ with the Chebyshev norm, D, i.e for any $\theta', \theta'' \in \Theta$, $D(\theta', \theta'') := \max_i |\theta'_i - \theta''_i|$.[49] One can verify that Θ (endowed with D) is compact.[50] Thus, there is a subsequence for which θ^m and τ^m converge respectively to limits $\theta^\infty, \tau^\infty \in \Theta$. A fortiori, in this subsequence, for any i, $\theta_i^m \to \theta_i^\infty$ and $\tau_i^m \to \tau_i^\infty$. Also, θ_i^∞ and τ_i^∞ are each non-increasing in i. For the remainder of the proof, restrict attention to the subsequence.

Now consider the unrestricted model, with the continuum of insiders. Let $\mathcal{N}$ be the countable set consisting of N_{so} Sell-Outs and N_{sc} Scoundrels, where $N_{so} := \sup\{i : \theta_i^\infty > 0\}$ and $N_{sc} := \sup\{i : \tau_i^\infty > 0\}$ (either could be infinite). Let μ assign the entry probability θ_i^∞ to the i-th Sell-Out in $\mathcal{N}$, and the probability τ_i^∞ to the i-th Scoundrel in $\mathcal{N}$. We will show that $(\mathcal{N}, \mu)$ is a mixed strategy equilibrium.

We first verify the candidate incentive constraint (16). We provide the argument for any Sell-Outs in $\mathcal{N}$; it is virtual identical for any Scoundrels. Pick any Sell-Out $i \in \mathcal{N}$. Since $\theta_i^m \to \theta_i^\infty > 0$, it must be that $\theta_i^m > 0$ infinitely often in m; focus on these cases. In the equilibrium of the m-th restricted model, $\left(\widehat{\theta}^m, \widehat{\tau}^m\right)$, let ρ_i^m denote the expected probability with which the i-th Sell-Out wins conditional on running, y_{avg}^m denote the expected quality of governance, and $y_{\text{avg}}^m(-i)$ denote the expected quality of governance when i does not run. The candidate incentive constraint for i implies that

$$\rho_i^m \left[u^G (1, 0 \mid \sigma, s) - 2 y_{\text{avg}}^m(-i) \right] \geq k, \tag{24}$$

with equality when $\theta_i^m \in (0, 1)$. One can show that as $m \to \infty$, $\rho_i^m \to \rho_i(\mathcal{N}, \mu)$ and

[49] Because of (23), the max is well defined even though Θ is infinite-dimensional.

[50] To prove compactness, note that (23) implies that for any $\varepsilon > 0$, there is a some i' such that for all $i \geq i'$, any $\theta \in \Theta$ has $\theta_i < \varepsilon$, and hence for any $\theta, \theta' \in \Theta$, $\max_{i<i'} |\theta_i - \theta'_i| < \varepsilon$ implies $D(\theta, \theta') < \varepsilon$. It follows that Θ is totally bounded. It is routine to verify that Θ is complete.

$y^m_{\text{avg}} \to y_{\text{avg}}(\mathcal{N}, \mu)$,[51] from which it also follows that $y^m_{\text{avg}}(-i) \to y_{\text{avg}}(\mathcal{N}\backslash i, \mu(-i))$.[52] Thus, passing to limits in (24), we have

$$\rho_i(\mathcal{N}, \mu)\left[u^G(1, 0 \mid \sigma, s) - 2y_{\text{avg}}(\mathcal{N}\backslash i, \mu(-i))\right] \geq k,$$

with equality whenever $\theta^\infty_i < 1$ (because then we must have $\theta^m_i \in (0, 1)$ for all large enough m). We have thus verified that (16) holds any Sell-Out in $\mathcal{N}$.

The proof is completed by showing that the non-candidate incentive constraint (17) holds for any insider $i \notin \mathcal{N}$, no matter his character type. By Lemma 2, it suffices to check incentives for Sell-Outs and Scoundrels. We will provide the argument for Sell-Outs; Scoundrels can be treated *mutatis mutandis*.

We divide the argument into two cases. First suppose there exists a subsequence of the restricted models such that for all large enough m, there is some Sell-Out i^m who does not enter in the equilibrium of the m-th model. Let $\rho^m(+i)$ denote the probability with which an individual i who does not run in the equilibrium of model m would win if he ran. The non-candidate incentive constraint for i^m implies that for any Sell-Out i who does not run in the equilibrium of model m:

$$\rho^m(+i)\left[u^G(1, 0 \mid \sigma, s) - 2y^m_{\text{avg}}\right] \leq k. \tag{25}$$

One can show that $\rho^m(+i) \to \rho_i(\mathcal{N} \cup i, \mu(+i))$ as $m \to \infty$.[53] Thus, passing to limits in (25), we have

$$\rho_i(\mathcal{N} \cup i, \mu(+i))\left[u^G(1, 0 \mid \sigma, s) - 2y_{\text{avg}}(\mathcal{N}, \mu)\right] \leq k,$$

[51] A proof for the convergence of ρ^m_i goes as follows (the argument for convergence of y^m_{avg} is along the same lines): Let $R^K_i(\theta, \tau)$ be i's probability of winning conditional on running when the first K Sell-Outs and Scoundrels running according to the probabilities given in $(\theta, \tau) \in \Theta^2$, while all others run with probability zero. Let B^K be some strict upper bound on the probability that one or more members of $\mathcal{N}$ other than the first K Sell-Outs and Scoundrels runs, given $(\theta^\infty, \tau^\infty)$. Note that (23) implies that by taking K sufficiently large we can make B^K arbitrarily small. Also note that B^K bounds the same probability for (θ^m, τ^m) when m is sufficiently large. It follows that $\left|\rho_i(\mathcal{N}, \mu) - R^K_i(\theta^\infty, \tau^\infty)\right| < B^K$ and $\left|\rho^m_i - R^K_i(\theta^m, \tau^m)\right| < B^K$ for large m. Moreover, because the probability of winning conditional on running is continuous in the entry probabilities for any finite set of agents, $R^K_i(\theta^m, \tau^m) \to R^K_i(\theta^\infty, \tau^\infty)$ as $m \to \infty$. Therefore, for any $\varepsilon > 0$, there exists M such that $|\rho^m_i - \rho_i(\mathcal{N}, \mu)| < \varepsilon$ for $m > M$.

[52] Note that $y^m_{\text{avg}}(-i) = \frac{y^m_{\text{avg}} - \rho^m_i y^i}{1 - \rho^m_i}$. Given the immediately preceding convergence statements, taking limits delivers the desired conclusion.

[53] The argument is analogous to that given in fn. 51.

which establishes that (17) holds for any Sell-Out $i \notin \mathcal{N}$.

Now consider the other possibility: in any subsequence of restricted models, it is infinitely often the case that *all* Sell-Outs enter with positive probability in the model's equilibrium. Then it is possible to find a subsequence of m and a Sell-Out in each model, say i^m, such that for all large m, $1 > \theta_{i^m}(m) > 0$ and $\lim_{m\to\infty} \theta_{i^m}(m) = 0$ (recall (23)). As $\theta_{i^m} \in (0,1)$, the candidate incentive constraint (16) must hold with equality:

$$\rho^m_{i^m}\left[u^G\left(1,0 \mid \sigma, s\right) - 2y^m_{\text{avg}}(-i^m)\right] = k. \tag{26}$$

Now pick any Sell-Out $i \notin \mathcal{N}$. Observe that the difference between $\rho^m_{i^m}$ and $\rho^m(+i)$ owes only to θ_{i^m}; similarly for the difference between the difference between $y^m_{\text{avg}}(-i^m)$ and y^m_{avg}. Since $\lim_{m\to\infty} \theta_{i^m}(m) = 0$, it follows that $\lim_{m\to\infty} \rho^m_{i^m} = \lim_{m\to\infty} \rho^m(+i)$ and $\lim_{m\to\infty} y^m_{\text{avg}}(-i^m) = \lim_{m\to\infty} y^m_{\text{avg}}$. Thus, passing to limits in (26) yields

$$\begin{aligned} k &= \lim_{m\to\infty} \rho^m_{i^m}\left[u^G\left(1,0 \mid \sigma, s\right) - 2y^m_{\text{avg}}(-i^m)\right] \\ &= \lim_{m\to\infty} \rho^m(+i)\left[u^G\left(1,0 \mid \sigma, s\right) - 2y^m_{\text{avg}}\right] \\ &= \rho_i\left(\mathcal{N}\cup i, \mu(+i)\right)\left[u^G\left(1,0 \mid \sigma, s\right) - 2y_{\text{avg}}\left(\mathcal{N}, \mu\right)\right], \end{aligned}$$

which establishes that (17) holds (with equality) for any Sell-Out $i \notin \mathcal{N}$. □

Proof of Lemma 4. Suppose the claim is false. Then for some $\varepsilon > 0$ there exists an infinite sequence of positive entry costs $k^m \to 0$, and a sequence of associated equilibria $(\mathcal{N}^m, \mu^m)$ such that each $\mathcal{N}^m$ contains some i^m with $\rho_{i^m}(\mathcal{N}^m, \mu^m) \geq 2\varepsilon$.

Letting $\mathcal{C}$ denote the realized set of candidates and c denote the realized number of candidates, note that

$$\rho_{i^m}(\mathcal{N}^m, \mu^m) = \sum_{c=0}^{|\mathcal{N}^m|} \frac{1}{c+1} P^m(c),$$

where

$$P^m(c) := \Pr\left[|\mathcal{C}| = c \mid (\mathcal{N}^m, \mu^m),\ i^m \ \notin \mathcal{C}\right]. \tag{27}$$

For any $i \notin \mathcal{N}^m$, we have

$$\begin{aligned}\rho_i(\mathcal{N}^m \cup i, \mu^m(+i)) &= (1-\mu^m_{i^m})\rho_{i^m}(\mathcal{N}^m, \mu^m) + \mu^m_{i^m} \sum_{c=0}^{|\mathcal{N}^m|} \frac{1}{c+2} P^m(c) \\ &\geq (1-\mu^m_{i^m})\rho_{i^m}(\mathcal{N}^m, \mu^m) + \mu^m_{i^m} \frac{1}{2} \sum_{c=0}^{|\mathcal{N}^m|} \frac{1}{c+1} P^m(c) \\ &= (1-\mu^m_{i^m})\rho_{i^m}(\mathcal{N}^m, \mu^m) + \mu^m_{i^m} \frac{\rho_{i^m}(\mathcal{N}^m, \mu^m)}{2} \\ &\geq \frac{\rho_{i^m}(\mathcal{N}^m, \mu^m)}{2} \geq \varepsilon.\end{aligned}$$

In other words, any non-candidate who enters would win with expected probability at least ε. For each equilibrium $(\mathcal{N}^m, \mu^m)$, the non-candidate incentive constraint must be satisfied for Sell-Outs and Scoundrels who are not members of $\mathcal{N}^m$:

$$\rho_i(\mathcal{N}^m \cup i, \mu^m(+i)) \left[u^G(0, 0 \mid \sigma, s) - y_{\text{avg}}(\mathcal{N}^m, \mu^m)\right] \leq k^m, \tag{28}$$

and

$$\rho_i(\mathcal{N}^m \cup i, \mu^m(+i)) \left[u^G(1, 0 \mid \sigma, s) - 2y_{\text{avg}}(\mathcal{N}^m, \mu^m)\right] \leq k^m. \tag{29}$$

Given that $\rho_i(\mathcal{N}^m \cup i, \mu^m(+i)) \geq \varepsilon$ and $y_{\text{avg}}(\mathcal{N}^m, \mu^m) \leq y^{\max}$, (28) and (29) imply:

$$\max\left\{u^G(0, 0 \mid \sigma, s) - y^{\max}, u^G(1, 0 \mid \sigma, s) - 2y^{\max}\right\} \leq \frac{k^m}{\varepsilon}. \tag{30}$$

The left-hand side of (30) is independent of m, and by the hypothesis that $\widehat{y}(\sigma, s) > y^{\max}$, it is also strictly positive. On the other hand, since $\varepsilon > 0$ is a constant and $k^m \to 0$, the right-hand side of (30) converges to zero as $m \to \infty$. Consequently, for m sufficiently large the right-hand side must be less than the left-hand side, a contradiction. □

Proof of Theorem 2. Suppose the theorem does not hold for some $\varepsilon > 0$. Then it must be possible to select a sequence of entry costs $k^m \to 0$ for which there is a corresponding sequence of multi-candidate equilibria, $(\mathcal{N}^m, \mu^m)$ with $|\mathcal{N}^m| = N^m$, such that for each m the set $\mathcal{N}^m$ includes some i^m with $(a^{i^m}, h^{i^m}) \notin B_\varepsilon(1, 0) \cup B_\varepsilon(0, 0)$. The incentive constraints (7) for each i^m and (8) for Sell-Outs and Scoundrels who are not in $\mathcal{N}^m$ imply

$$\begin{aligned} 0 \;\leq\; & \Delta\left(a^{i^m}, h^{i^m}, y^e(\mathcal{N}^m \backslash i^m, \mu^m(-i^m)\right) \\ & - R^m \max\left\{\Delta\left(0, 0, y^e(\mathcal{N}^m, \mu^m)\right), \Delta\left(1, 0, y^e(\mathcal{N}^m, \mu^m)\right)\right\}, \end{aligned} \tag{31}$$

where

$$R^m := \frac{\rho_i\left(\mathcal{N}^m \cup i, \mu^m(+i)\right)}{\rho_{i^m}\left(\mathcal{N}^m, \mu^m\right)}. \tag{32}$$

Let $y^* := \lim_{m\to\infty} y_{\text{avg}}(\mathcal{N}^m, \mu^m)$ (if necessary, focus on subsequence that converges, which is assured since $y_{\text{avg}}(\cdot)$ lives in a compact space). The proof now proceeds in three steps.

Step 1: $\lim_{m\to\infty} y_{\text{avg}}(\mathcal{N}^m \backslash i^m, \mu^m(-i^m)) = y^*$.

It follows from (15) that

$$y_{\text{avg}}(\mathcal{N}^m, \mu^m) - y_{\text{avg}}(\mathcal{N}^m \backslash i^m, \mu^m(-i^m)) = \rho_{i^m}\left(\mathcal{N}^m, \mu^m\right)\left[y^{i^m} - y_{\text{avg}}(\mathcal{N}^m \backslash i^m, \mu^m(-i^m))\right].$$

The desired conclusion then follows from the facts that $\rho_{i^m}\left(\mathcal{N}^m, \mu^m\right) \to 0$ (Lemma 4) whereas the quality of governance is bounded.

Step 2: $\lim_{m\to\infty} R^m = 1$.

We will argue that $\lim_{m\to\infty} \frac{1}{R^m} = 1$. Since $\rho_{i^m}\left(\mathcal{N}^m, \mu^m\right) > \rho_i\left(\mathcal{N}^m \cup i, \mu^m(+i)\right)$, it suffices to show that that the limit of $\frac{1}{R^m}$ is no greater than one. We can express

$$\frac{1}{R^m} = \left[\sum_{c=0}^{N^m} \frac{1}{c+1} P^m(c)\right] \times \left[(1-\mu^m_{i^m}) \sum_{c=0}^{N^m} \frac{1}{c+1} P^m(c) + \mu^m_{i^m} \sum_{c=0}^{N^m} \frac{1}{c+2} P^m(c)\right]^{-1},$$

where $P^m(c)$ is given by (27). Now choose any integer $K \geq 1$. Given that all the terms in summations above are non-negative and that the right-hand side is increasing in $\mu^m_{i^m}$, we have

$$\begin{aligned}
\frac{1}{R^m} &\leq \left[\sum_{c=0}^{K}\frac{1}{c+1}P^m(c)+\sum_{c=K}^{N^m}\frac{1}{c+1}P^m(c)\right]\times\left[\sum_{c=0}^{N^m}\frac{1}{c+2}P^m(c)\right]^{-1} \\
&\leq \left[\sum_{c=0}^{K}\frac{1}{c+1}P^m(c)+\sum_{c=K}^{N^m}\frac{1}{c+1}P^m(c)\right]\times\left[\sum_{c=K}^{N^m}\frac{1}{c+2}P^m(c)\right]^{-1} \\
&\leq \left[\sum_{c=0}^{K}\frac{1}{c+1}P^m(c)+\sum_{c=K}^{N^m}\frac{1}{c+1}P^m(c)\right]\times\left[\frac{K+1}{K+2}\sum_{c=K}^{N^m}\frac{1}{c+1}P^m(c)\right]^{-1} \\
&= \left(\frac{K+2}{K+1}\right)\left(1+\left[\sum_{c=0}^{K}\frac{1}{c+1}P^m(c)\right]\times\left[\sum_{c=K}^{N^m}\frac{1}{c+1}P^m(c)\right]^{-1}\right).
\end{aligned}$$

Suppose, as we will prove subsequently, that

$$\forall K\in\mathbb{N}:\quad \lim_{m\to\infty}\left(\left[\sum_{c=0}^{K}\frac{1}{c+1}P^m(c)\right]\times\left[\sum_{c=K}^{N^m}\frac{1}{c+1}P^m(c)\right]^{-1}\right)=0. \tag{33}$$

Then for any $K\in\mathbb{N}$, $\lim_{m\to\infty}\frac{1}{R^m}\leq\frac{K+2}{K+1}$, which implies that $\lim_{m\to\infty}\frac{1}{R^m}\leq 1$, completing the proof of Step 2. Consequently, all that remains is to prove (33).

Observe that for any convergent sequences ζ^m and ψ^m, $\lim_{m\to\infty}\frac{\zeta^m}{\psi^m}=0$ if and only if $\lim_{m\to\infty}\frac{\zeta^m}{\zeta^m+\psi^m}=0$. Thus, (33) holds if and only if for all $K\in\mathbb{N}$,

$$\lim_{m\to\infty}\left(\left[\sum_{c=0}^{K}\frac{1}{c+1}P^m(c)\right]\times\left[\sum_{c=0}^{N^m}\frac{1}{c+1}P^m(c)\right]^{-1}\right)=0 \tag{34}$$

With respect to the denominator in (34), we note that $\frac{1}{c+1}$ is convex and apply Jensen's inequality to get

$$\sum_{c=0}^{N^m}\frac{1}{c+1}P^m(c)=\mathbb{E}^m\left(\frac{1}{c+1}\right)\geq\frac{1}{\mathbb{E}^m(c)+1}, \tag{35}$$

where $\mathbb{E}^m(\cdot)$ is the expectation using the distribution $P^m(c)$.

With respect to the numerator in (34), we note that

$$\sum_{c=0}^{K} \frac{1}{c+1} P^m(c) \leq \sum_{c=0}^{K} P^m(c). \tag{36}$$

The right-hand side of (36) represents the probability of having no more than K "successes" in $|\mathcal{N}^m \setminus i^m|$ independent trials, where each trial i has a probability of success μ_i^m. There are now two cases to consider.

Case 1: Suppose first that there is some subsequence of m such that $N^m < \infty$ for all m in the subsequence. Then, Theorem 4 of Hoeffding (1956) implies that the right-hand side of (36) is bounded above by the corresponding probability for a binomial distribution with $N^m - 1$ independent trials and a constant success probability $\overline{\mu}^m := \mathbb{E}^m(c)/(N^m - 1)$, provided $K \leq \mathbb{E}^m(c) - 1$. Thus, for m sufficiently large (so that $\mathbb{E}^m(c) > K$, which Lemma 4 guarantees will occur), we have

$$\sum_{c=0}^{K} P^m(c) \leq \sum_{c=0}^{K} \binom{N^m - 1}{c} (\overline{\mu}^m)^c (1 - \overline{\mu}^m)^{N^m - 1 - c}. \tag{37}$$

Since the binomial distribution corresponding to the right-hand side of (37) is single-peaked and has mode no smaller than $\mathbb{E}^m(c) - 1$, for sufficiently large m (so that once again $K < \mathbb{E}^m(c)$), the summand on the right-hand side of (37) is maximized for $c = K$, implying

$$\begin{aligned} \sum_{c=0}^{K} P^m(c) &\leq (K+1) \binom{N^m - 1}{K} (\overline{\mu}^m)^K (1 - \overline{\mu}^m)^{N^m - 1 - K} \\ &\leq (K+1) (N^m - 1)^K (\overline{\mu}^m)^K (1 - \overline{\mu}^m)^{N^m - 1 - K} \\ &= (K+1) (\mathbb{E}^m(c))^K (1 - \overline{\mu}^m)^{\mathbb{E}^m(c)/\overline{\mu}^m - K}. \end{aligned} \tag{38}$$

Combining (35), (36), and (38), we have

$$\begin{aligned} \left[\sum_{c=0}^{K} \frac{1}{c+1} P^m(c)\right] \times \left[\sum_{c=0}^{N^m} \frac{1}{c+1} P^m(c)\right]^{-1} &\leq (\mathbb{E}^m(c) + 1)(K+1)(\mathbb{E}^m(c))^K (1 - \overline{\mu}^m)^{\mathbb{E}^m(c)/\overline{\mu}^m - K} \\ &\leq (K+1)(\mathbb{E}^m(c) + 1)^{K+1} (1 - \overline{\mu}^m)^{\mathbb{E}^m(c)/\overline{\mu}^m - K}. \end{aligned}$$

There are now two possibilities to consider. The first is that there is some $\xi \in (0,1)$ such that $\overline{\mu}^m > 1-\xi$ for m sufficiently large. In that case, for large enough m,

$$(K+1)\left(\mathbb{E}^m(c)+1\right)^{K+1}\left(1-\overline{\mu}^m\right)^{\mathbb{E}^m(c)/\overline{\mu}^m-K} \leq (K+1)\left(\mathbb{E}^m(c)+1\right)^{K+1}\xi^{\mathbb{E}^m(c)-K}. \qquad (39)$$

As $m\to\infty$, $\mathbb{E}^m(c)\to\infty$ and $\xi^{\mathbb{E}^m(c)-K}$ dominates $\left(\mathbb{E}^m(c)+1\right)^{K+1}$, so the expression on right-hand side of (39) converges to zero. Thus, (34) follows immediately for this case.

The second possibility is that there is no such ξ. In that case, we can assume without loss of generality that $\overline{\mu}^m \to 0$ as $m\to\infty$ (if necessary by restricting attention to a convergent subsequence). We then have $\lim_{m\to\infty}\left(1-\overline{\mu}^m\right)^{1/\overline{\mu}^m} = \frac{1}{e}$. So fixing some $\xi \in \left(1-\frac{1}{e},1\right)$, for m sufficiently large we have

$$(K+1)\left(\mathbb{E}^m(c)+1\right)^{K}\left(1-\overline{\mu}^m\right)^{\mathbb{E}^m(c)/\overline{\mu}^m-K} \leq (K+1)\left(\mathbb{E}^m(c)+1\right)^{K}\xi^{\mathbb{E}^m(c)}\left(1-\overline{\mu}^m\right)^{-K}. \quad (40)$$

As $m\to\infty$, $\mathbb{E}^m(c)\to\infty$ and $\xi^{\mathbb{E}^m(c)}$ dominates $\left(\mathbb{E}^m(c)+1\right)^{K}$, while $\left(1-\overline{\mu}^m\right)^{-K}\to 1$, so the expression on the right-hand side of (40) converges to zero. Thus, (34) follows for this case as well.

Case 2: Now suppose that in any subsequence of the original sequence of m, $N^m=\infty$ infinitely often. Pick any subsequence where $N^m=\infty$ for all m. We will use a subscript of n on $\mathbb{E}^m_n(c)$ and P^m_n to denote the respective objects when the set $\mathcal{N}^m$ is restricted to a finite subset of the first n candidates, and let $\overline{\mu}^m_n := \mathbb{E}^m_n(c)/n$. Then, because $\sum_{c=0}^{K} P^m(c) \leq \sum_{c=0}^{K} P^m_n(c)$ for any n (adding individuals can only increase the number of realized candidates), the same argument as in Case 1 can now be applied to a large enough subset of $\mathcal{N}^m$, allowing us to conclude that for large enough m and large enough n,

$$\begin{aligned}
\sum_{c=0}^{K} P^m(c) &\leq \sum_{c=0}^{K}\binom{n}{c}\left(\overline{\mu}^m_n\right)^c\left(1-\overline{\mu}^m_n\right)^{n-c} \\
&\leq (K+1)\binom{n}{K}\left(\overline{\mu}^m_n\right)^K\left(1-\overline{\mu}^m_n\right)^{n-K} \\
&\leq (K+1)\left(n\right)^K\left(\overline{\mu}^m_n\right)^K\left(1-\overline{\mu}^m_n\right)^{n-K} \\
&= (K+1)\left(\mathbb{E}^m_n(c)\right)^K\left[\left(1-\overline{\mu}^m_n\right)^{1/\overline{\mu}^m_n}\right]^{\mathbb{E}^m_n(c)}\left(1-\overline{\mu}^m_n\right)^{-K}. \qquad (41)
\end{aligned}$$

For any fixed m, as $n\to\infty$, $\mathbb{E}^m_n(c)\to\mathbb{E}^m(c)<\infty$ (as was discussed in the proof of Lemma 3), hence $\overline{\mu}^m_n\to 0$, which in turn implies that $\left(1-\overline{\mu}^m_n\right)^{1/\overline{\mu}^m_n}\to\frac{1}{e}$ while $\left(1-\overline{\mu}^m_n\right)^{-K}\to 1$.

Therefore, taking the limit as $n \to \infty$ in (41) yields

$$\sum_{c=0}^{K} P^m(c) \leq (K+1)\left(\mathbb{E}^m(c)\right)^K e^{-\mathbb{E}^m(c)}. \tag{42}$$

Combining (35), (36), and (42), we get

$$\begin{aligned}\left[\sum_{c=0}^{K} \frac{1}{c+1} P^m(c)\right] \times \left[\sum_{c=0}^{N^m} \frac{1}{c+1} P^m(c)\right]^{-1} &\leq \left(\mathbb{E}^m(c)+1\right)(K+1)\left(\mathbb{E}^m(c)\right)^K e^{-\mathbb{E}^m(c)} \\ &\leq (K+1)\left(\mathbb{E}^m(c)+1\right)^{K+1} e^{-\mathbb{E}^m(c)}.\end{aligned}$$

As $m \to \infty$, $\mathbb{E}^m(c) \to \infty$ and $e^{-\mathbb{E}^m(c)}$ dominates $(\mathbb{E}^m(c)+1)^{K+1}$, hence the expression on the right-hand side above converges to zero. Thus, (34) follows.

Step 3: Proof of the theorem.

Suppose without loss of generality that the sequence hypothesized at the start of the proof, (a^{i^m}, h^{i^m}), converges to some limit (a^*, h^*), if necessary choosing a subsequence of the original sequence. Since $(a^{i^m}, h^{i^m}) \notin B_\varepsilon(1,0) \cup B_\varepsilon(0,0)$ for any m, it must also be that $(a^*, h^*) \notin B_\varepsilon(1,0) \cup B_\varepsilon(0,0)$. Since (31) holds for all m, it follows that

$$\begin{aligned} 0 &\leq \lim_{m\to\infty} \left[\Delta\left(a^{i^m}, h^{i^m}, y_{\text{avg}}(\mathcal{N}^m \backslash i^m, \mu^m(-i^m)\right)\right. \\ &\quad \left. - R^m \max\left\{\Delta\left(0,0,y_{\text{avg}}(\mathcal{N}^m,\mu^m)\right), \Delta\left(1,0,y_{\text{avg}}(\mathcal{N}^m,\mu^m)\right)\right\}\right] \\ &= \Delta\left(a^*, h^*, y^*\right) - \max\left\{\Delta\left(0,0,y^*\right), \Delta\left(1,0,y^*\right)\right\}, \end{aligned}$$

where the equality uses Steps 1 and 2 and the continuity of $\Delta(\cdot)$. However, Lemma 2 implies that $\max\{\Delta(0,0,y^*), \Delta(1,0,y^*)\} > \Delta(a^*, h^*, y^*)$ for $(a^*, h^*) \notin B_\varepsilon(1,0) \cup B_\varepsilon(0,0)$, a contradiction. □

Proof of Theorem 3. Suppose the theorem is false for some $\varepsilon > 0$. Then it is possible to select a sequence of entry costs $k^m \to 0$ for which there is a corresponding sequence of multi-candidate equilibria, $(\mathcal{N}^m, \mu^m)$, such that for each m, $|y_{\text{avg}}(\mathcal{N}^m, \mu^m) - \widetilde{y}(\sigma)| > \varepsilon$. Without loss of generality, we can assume that $y_{\text{avg}}(\mathcal{N}^m, \mu^m)$ converges to a limit point y_∞, with either (i) $y_\infty > \widetilde{y}(\sigma) + \varepsilon$ for some $\varepsilon > 0$ and $y_{\text{avg}}(\mathcal{N}^m, \mu^m) > \widetilde{y}(\sigma) + \varepsilon$ for all m, or (ii) $y_\infty < \widetilde{y}(\sigma) - \varepsilon$ for some $\varepsilon > 0$ and $y_{\text{avg}}(\mathcal{N}^m < \widetilde{y}(\sigma) - \varepsilon$ for all m. (If necessary, choose an appropriate subsequence of the original sequence.) We will focus on case (i); the argument for case (ii) is symmetric (replacing Sell-Outs with Scoundrels, and vice versa).

Because $y_{\text{avg}}(\mathcal{N}^m, \mu^m) > \widetilde{y}(\sigma) + \varepsilon$ for all m, Theorem 2 implies that there must be $i^m \in \mathcal{N}^m$ for each m such that $(a^{i^m}, h^{i^m}) \to (1, 0)$ (a Sell-Out) as $m \to \infty$. Furthermore, by Lemma 2, Scoundrels have the greatest incentive to run for office. According to (31), equilibrium then requires

$$0 \leq \Delta\left(a^{i^m}, h^{i^m}, y_{\text{avg}}(\mathcal{N}^m \backslash i^m, \mu^m(-i^m))\right) - R^m \Delta\left(0, 0, y_{\text{avg}}(\mathcal{N}^m, \mu^m)\right)$$

where R^m is defined by (32). Taking limits as $m \to \infty$ (and invoking the continuity of $\Delta(\cdot)$, the fact that $|\mathcal{N}^m|$ grows without bound, and Step 2 of the proof of Theorem 2), we have

$$0 \leq \Delta\left(1, 0, y_\infty\right) - \Delta\left(0, 0, y_\infty\right).$$

But with $y_\infty > \widetilde{y}(\sigma)$, the right-hand side above is strictly negative by Lemma 2, a contradiction. □

Proof of Theorem 4. Define

$$\Delta^\Pi(a, h, y) := \left[1 + \lambda \Pi\left(Y\left(a, h \mid \sigma\right)\right)\right] \Delta(a, h, y).$$

From Lemma 2, we know that $\Delta(1, 0, y) \geq \Delta(a, h, y)$ for all $(a, h) \neq (1, 0)$ and $y \leq y^*(\sigma)$, with strict equality except for $(a, h, y) = (0, 0, y^*(\sigma))$. As long as $\Delta(1, 0, y) > 0$, given our assumption on Π, we have $\Delta^\Pi(1, 0, y) > \Delta^\Pi(a, h, y)$ for all $(a, h) \neq (1, 0)$ with $Y(a, h \mid \sigma) \leq Y(1, 0 \mid \sigma)$ and $y \leq y^*(\sigma)$. By continuity of Δ^Π in its third argument, for any $\eta_1 > 0$ and some small $\eta_2 > 0$, the same statement holds for $Y(a, h \mid \sigma) \leq Y(1, 0 \mid \sigma) - \eta_1$ and $y \leq \overline{y}(\sigma) + \eta_2$.

Now assume the theorem is false. Then it must be possible to select some sequence of entry costs $k_m \to 0$ for which there is a corresponding sequence of multi-candidate equilibria, $(\mathcal{N}_m, \mu_m)$ such that $\lim_{m \to \infty} y_{\text{avg}}(\mathcal{N}_m, \mu_m) \leq y^*(\sigma)$. By the argument in the preceding paragraph, for sufficiently large m, Sell-Outs would have strictly greater incentives to enter than any other type (a, h) with $Y(a, h \mid \sigma) \leq Y(1, 0 \mid \sigma) - \eta_1$. Through an argument paralleling the one given in the proof of Theorem 3, one can then show that, in the limit, the quality of the worst candidate must converge to a limit no less than $Y(1, 0 \mid \sigma)$. But that implication contradicts the assumption that average quality converges to a limit no greater than $y^*(\sigma)$. □

Proof of Theorem 5. For this proof we will augment the arguments of Δ to including α, writing $\Delta(a,h,y,\alpha)$. It is easily verified that Δ is weakly decreasing in α, and strictly so for any a,h such that $\overline{v}-v^*(a,h,\sigma)>0$, which is the case for any a and $h=0$.

Fix $\alpha_2>\alpha$. Define

$$\Delta^{\Pi,\alpha_2}(a,h,y):=\Delta(a,h,y,\alpha)+\lambda\Pi(Y(a,h\mid\sigma))\Delta(a,h,y,\alpha_2).$$

Define C to be the set of character types of quality strictly less than $\frac{y^{\min}(\sigma)+y^*(\sigma)}{2}$. From Lemma 2 we know that $\Delta(a,h,y,\alpha)-\Delta(0,0,y,\alpha)\leq 0$ for all $y\geq y^*(\sigma)$ and $(a,h)\neq(0,0)$, with strict inequality when $y>y^*(\sigma)$ or $(a,h)\neq(1,0)$. Thus, if $\Pi(y^{\max})=\Pi(y^{\min}(\sigma))$, then for all $y\geq y^*(\sigma)$,

$$\sup_{(a,h)\notin C}\left(\Delta^{\Pi,\alpha_2}(a,h,y)-\Delta^{\Pi,\alpha_2}(0,0,y)\right)<0. \tag{43}$$

By the continuity of Δ, there exist $\varepsilon,\eta>0$ with $y^*(\sigma)-\eta>\frac{y^{\min}(\sigma)+y^*(\sigma)}{2}$ such that (43) holds for all $y\geq y^*(\sigma)-\eta$ provided $\Pi(y^{\max})<\Pi(y^{\min}(\sigma))+\varepsilon$.

We claim that the theorem holds for the ε and η defined in the previous paragraph. Assume not. Then there is some non-decreasing $\Pi(\cdot)$ satisfying $\Pi(y^{\max})<\Pi(y^{\min}(\sigma))+\varepsilon$ such that it is possible to select a sequence of entry costs $k_m\to 0$ for which there is a corresponding sequence of multi-candidate equilibria, $(\mathcal{N}_m,\mu_m)$, such that $y_{\text{avg}}(\mathcal{N}_m,\mu_m)>y^*(\sigma)-\eta$. From the preceding paragraph, we know that for all m, Scoundrels have a strictly greater incentive to enter than any type with quality exceeding $\frac{y^{\min}(\sigma)+y^*(\sigma)}{2}$. Through an argument paralleling the one given in the proof of Theorem 3, one can then show that, in the limit as $m\to 0$, the quality of the best candidate cannot exceed $\frac{y^{\min}(\sigma)+y^*(\sigma)}{2}<y^*(\sigma)-\eta$. But that contradicts the assumption that $y_{\text{avg}}(\mathcal{N}_m,\mu_m)>y^*(\sigma)-\eta$ for all m. □

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